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HEALTH EFFECTS OF LEAD EXPOSURE

HEARING

BEFORE THE

SUBCOMMITTEE ON
TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT,
RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

MARCH 8, 1990

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HEALTH EFFECTS OF LEAD EXPOSURE

THURSDAY, MARCH 8, 1990

U.S. SENATE, COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:33 a.m. in room 406, Dirksen Senate Office Building, Hon. Harry Reid [chairman of the subcommittee] presiding.

Present: Senators Reid, Chafee, and Lieberman.

OPENING STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM THE STATE OF NEVADA

Senator REID. The committee will come to order.

Today the Subcommittee on Toxic Substances, Environmental Oversight, Research and Development will hear testimony on a health problem that may be causing brain and behavioral problems among 3 million to 4 million American children. If that alarming estimate is true, one out of every six preschoolers in the United States is a victim.

This potentially devastating health problem is lead poisoning. The effects of lead disease are untreatable, the harms irreversible. We are all exposed, but our children are at greater risk because of their age and because they are still growing.

The problem of lead poisoning in 3 million to 4 million American children is too great—and many of the proposed solutions are too expensive—for State and local governments to handle by themselves. The Federal Government must get involved.

Congress and the President have several choices. Among those choices:

Number one, rewrite the Federal laws governing lead pollution;

Two, change the administrative rules governing lead poisoning;

Three, enforce existing laws and regulations;

Four, increase coordination among Government agencies responsible for regulating lead in the environment; and

Five, help provide more money for cleanup efforts and assistance to lead victims.

The purpose of this hearing this morning is to focus attention on the problem in order to change public policy concerning the foremost disease among American youngsters. Washington has a responsibility to help the 3 million to 4 million preschoolers in this country who have been dangerously exposed to this untreatable disease.

Several months ago my wife and I learned that our son and daughter-in-law were expecting their first child. More recently—in fact, during the past four or five days—we learned that our only daughter is expecting her first child. The prospect of becoming grandparents, is exciting, but with what I have learned in preparing for this hearing, I have to admit that I am concerned for my grandchildren. I am concerned that my grandchildren will confront a severe and unnecessary health risk because of lead in the environment.

In Las Vegas, where my son and daughter-in-law live, 28.6 percent of the children between the ages of six months and five years have dangerously high levels of lead in their blood. In Reno, Nevada, 22.6 percent of preschool children have dangerously high levels of lead in their blood.

The problem in Nevada is potentially severe, but the news for the rest of the country is even worse. Here in Washington, D.C., the Nation's capital, where my daughter lives, 51.7 percent of preschoolers have high lead levels. In New York City, the figure is 74.7 percent; in Los Angeles, 58.2 percent; in Atlanta, over 47 percent; and Chicago, about 62 percent.

What do all these numbers mean in biological terms? In layman's terms, even?

They mean that severe exposure to lead can cause comas, convulsions, and even death in adults and children. Long-term exposure often results in brain damage and, of course, behavioral problems.

But lead poisoning is nothing new. The Romans used lead for water pipes, in their storage containers, and in drinking goblets. It contaminated most of the wine that the Romans drank. This pervasive lead contamination, according to some historians, may have lowered the birthrate among the Romans and caused much of the documented madness that helped bring down this ancient empire.

Concern about severe exposure to lead in the United States has resulted in a number of Federal and State regulations that have sought to reduce the amount of lead in our environment generally. In 1977, the Federal Government banned most uses of lead in paint, and in 1986 it banned lead in pipe and solder in plumbing that carried potable water. Over 90 percent of the lead in leaded gasoline was removed between 1975 and 1986. Lead levels in the air are now very low as a result of the move to unleaded gasoline.

However, even small levels of lead may be dangerous, particularly to children. Medical research has shown that exposure to lead at a young age may cause poor hand-eye coordination and lower reading levels.

Although there may be some debate about the precise levels at which exposure to lead begins to harm our children, experts agree that exposure to lead is a continuing threat to millions of American children.

So what is the source of this lead contamination? It is literally in the past. Most of the lead pollution in the United States was produced years ago, before the health dangers of lead exposure were thoroughly documented.

In the past, as we all know, American cars ran on leaded gasoline. We painted our houses with oil paint that contained large quantities of lead. We used lead pipes for the plumbing in our houses and in our schools. That's why there is lead in our water, in our homes, and, of course, throughout our cities.

I mentioned my daughter in the earlier part of my statement. My daughter and her husband purchased their first home here in the Washington area. We all know how expensive homes are. They were fortunate to buy a nice old home. This home is 53 years old, and if I knew what I now know, I would have talked them out of buying that home. That home has some problems with paint. They decided that they wanted to have the old paint removed from the baseboards, the chair rails, the windows and doors. They got an estimate on this small home of $4,100. That's a lot of money. What about removing the paint from the whole home, all the home? The home is 53 years old. This is expensive. How many people can afford to remove this old paint from their homes? Not many, and this is the reason that we have the health problems that we do. It is a matter of dollars.

I say—and this is an understatement—that it is extremely troublesome and discouraging for parents who have to choose between this expense and protecting the health of their children.

Once kids leave their homes, they confront new dangers from lead poisoning. In Nevada, on the very day that Professor Needleman—one of our witnesses today—published his recent report on the dangers of lead, a Reno grade school was forced to turn off two drinking fountains because of high lead levels in the water.

One encouraging development is the overall performance of the lead industry in some capacities. Despite variations among individual smelters, the industry seems to have taken commendable steps to reduce pollution from its operations.

Ladies and gentlemen, the purpose of this hearing is to focus congressional and public attention on the problem of lead poisoning, to determine the extent of the problem, and to explore possible means of reducing our children's exposure to lead. A number of distinguished people have agreed to give testimony, and I am looking forward to this hearing to see what they have to say.

I would particularly like to welcome Mr. Jeff Fontaine from the Nevada State Health Division who has flown almost 3,000 miles to be here today in order to give evidence about lead contamination in Nevada's drinking water.

On behalf of this subcommittee, I would like to thank all of you for taking the time and trouble to testify at this hearing. Your testimony is valuable to this subcommittee and, even more, urgent to the approximately 4 million children who may be victims of this health problem.

Senator **Reid**. Senator Chafee.

OPENING STATEMENT OF HON. JOHN H. CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator **Chafee**. Thank you very much, Mr. Chairman.

First, I want to congratulate and thank you for holding these hearings on a subject that I am deeply interested in, and I am very glad that you are doing this. It is certainly a prestigious group of witnesses that you have.

As you know, I am the floor manager of the Clean Air bill which is on the floor right now, so unfortunately I have to go back over to handle that. However, I did want to take this opportunity to welcome Dr. Bela Matyas from the Rhode Island Health Department and to say how pleased I am that she came down to testify at this important hearing.

Thank you very much, and I am sorry I have to go.

Senator Reid. Your statement and a statement from Senator Jeffords will be made a part of the record.

Senator Chafee. Thank you.

[The statements referred to follow:]

Opening Statement of Hon. John H. Chafee, U.S. Senator From the State of Rhode Island

Mr. Chairman, I want to thank you for convening this hearing today to focus on the very troubling and persistent problem of lead poisoning in our country—particularly as the problem affects our children. The recent study published in the New England Journal of Medicine raises disturbing new questions about the long-range adverse effects of elevated levels of lead in the human body, and I join with you in your belief that it is high time our government took decisive action to attack this problem.

In my view, we should focus our efforts during this hearing on the following items: First, we should define the nature of the problem and rank in priority order the sources of the problem. My own review of the facts suggests that leaded paint tops the list of sources that need to be addressed, but that lead in soil also is a problem in some urban areas.

I have within the past two years had direct experience in Rhode Island with an urban neighborhood that suffered serious lead contamination in the soil, and I am quite pleased today that Dr. Bela Matyas of the Rhode Island Department of Health is here to share his experience and insight gleaned from his front-line experience with combatting lead poisoning in my State. Unfortunately, because the federal government response to lead poisoning has been diffuse and uncoordinated—as well as underfunded—it is people like Dr. Matyas who have had to bear the brunt of the effort to prevent and to treat lead poisoning. So I am looking forward to hearing from him today.

Second, after we define the nature of the problem and rank the sources of the problem in priority order, we should, in my view, set about to develop a coordinated and adequately funded federal strategy for resolving the problem. The focus clearly should be on prevention and abatement. One central coordinating agency should drive the process. And we should demand results.

And we should demand results quickly. Because, as you know, Mr. Chairman, the statistics on this problem are startling: over 1.7 million children in this country currently live in unsound housing units that contain lead-based paint. These children are exposed to lead not only by eating paint chips on windowsills and elsewhere, but also simply by inhaling household dust that contains microscopic paint particles. In my own State of Rhode Island, data generated by the Public Health Service suggests that fully 25 percent of black and white children living in the central cities of Providence, Warwick, and Pawtucket have blood lead levels that exceed those that are linked to various learning and social disorders.

So, Mr. Chairman, I share your deep concern over this problem, and I am quite hopeful that this hearing will serve as a springboard to set meaningful solutions in motion, including legislation that will be enacted promptly. I have several questions that I will ask the witnesses at the appropriate time. Thank you.

Opening Statement of Hon. James M. Jeffords, U.S. Senator From the State of Vermont

Mr. Chairman, I'd like to thank you for holding this important hearing to discuss the issue of long-term health effects related to lead exposure. This is an issue of particular concern to me because it unevenly threatens the most vulnerable members of society—our nations children, yet it appears to be one that with proper commitment could be solved.

As I work with this Subcommittee to pass various pieces of environmental legislation, it has struck me how difficult establishing acceptable levels of risk can be for various pollutants. But few would argue that lead is not posing serious health effects to the members of society even in very small amounts, especially to the youngest and poorest in our older cities. What concerns me is the suggestion from the science community that lead presents a "continuum of toxicity" meaning that even minimal exposure has the potential of resulting in life-long complications. Children affected may face a life plagued with learning and behavioral difficulties which will be carried into adulthood. Estimates are that 3-4 million American children have potentially damaging blood lead-levels. This is unacceptable! Children today, especially those growing up in older inner-city neighborhoods do not need any further obstacles placed in their paths.

During our nations industrial period through the middle decades of this century, lead was not known to have the health effects we now recognize. We used this material in constructing homes and water systems in amounts unmatched by our international neighbors. Some allege that in general, the blood lead-level in Americans is twice that found in other western nations. This is a staggering thought with serious ramifications on our nations future well-being. We have begun to ban the use of lead in gasoline, paint and drinking water systems. But, merely prohibiting the use of additional lead-based paint in dwellings has proven to be inadequate. The problems we face with lead is that we have created a huge reservoir of this material and we have only just begun to consider how to dispose of it. Even as we struggle with a solution to reduce this reservoir, we continue adding to it with products such as car batteries, gasoline and other various items.

Mr. Chairman, once again I thank you for convening this important hearing. I look forward to hearing from the witnesses today, their recommendations for reducing this reservoir of lead as well as ways to protect our children from suffering lead poisoning.

Senator REID. Senator Lieberman.

OPENING STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

Senator LIEBERMAN. Thank you, Chairman Reid. Thank you for convening this hearing, and congratulations on the expansion of the Reid family, which you have announced this morning. That's good news, and I hope that we can work together to protect their health and the health of all children.

Mr. Chairman, as you said so well, lead is a toxic substance. It is literally a poison which causes particular harm to our children. The fact is that children under five who are exposed to lead may suffer a lifetime of devastating neurological effects. The more we know about lead and its effect on our health, the more we have to be concerned about it. Medical experts now believe that this early exposure to lead causes impairments in reading skills, deficits in vocabulary, difficulty in concentrating, and a sevenfold increase in the failure to graduate from high school. Those are startling findings, to me.

At a time when educators and economists and politicians are all expressing concern about the significant numbers of young people in America who don't graduate from high school or don't read or write well enough to function effectively in our society, we find that we have 3 million to 4 million kids who are suffering from a handicap through no fault of their own before they even get to school. These children enter school with their ability to learn already significantly damaged, and the infuriating part of it is that all of that damage is from something that is totally out of their control.

The outrage of all this is that for at least two decades we have known about the dangers of lead. For at least two decades we have failed to launch a serious attack on the lead that is in our environment which harms our kids.

I first became familiar with this in a more personal way, when I was Attorney General of the State of Connecticut and joined a petition to the FDA, urging that warning labels be placed on all lead solder cans. We also tried to educate people in Connecticut about the dangers of refrigerating food in open lead solder cans, and we worked with plumbers in the State to ensure that they were in compliance with the State law that banned high lead solder in drinking water systems.

But one of the most disturbing things that I discovered during that period of time was that lead paint actually was still being sold in Connecticut stores for home use, six years after the Federal Government had banned lead from household paint. Some of that paint had been manufactured prior to the ban, and some of it had been made with lead for industrial use but nonetheless was being sold as a household paint to unsuspecting customers. Well, we took legal action in that case, but I suspect that it's happening in similar ways around our country.

What has the Federal Government been able to do about this? From 1973 to 1981, CDC—the Centers for Disease Control—had a fully-funded lead screening program, but in 1981 the program was eliminated, I presume for lack of funds. Only in 1990 did CDC receive $4 million of a $66 million authorization to support some screening efforts.

EPA has scattered responsibility for lead throughout the agency as part of other pollution control and prevention programs, such as air and drinking water. But in my opinion, the agency has not focused a single responsible office on lead and recognized it as a unique toxic substance which must particularly be put out of the reach of our children.

HUD was first instructed by Congress to determine how to remove lead-based paint from residences in 1971, almost 20 years ago. In 1973, Congress instructed HUD to eliminate lead paint in all homes in which it presented a hazard. However, lead paint has never been banned, and in 1990—19 years later—HUD is yet to begin an organized removal of lead from public housing, much less from private residences around this country. We have quite literally failed our children by not protecting them. We have not focused our funds and our energies on eliminating lead from our homes.

This hearing presents us with a unique opportunity to bring together the experts: the public health specialists and toxicologists who have studied lead for years; those who have worked at the State and local level to remove lead from houses, water, and soil; those who have worked on legislation at the State level; representatives of the lead industry; and the three Federal agencies with responsibilities for protecting us from the toxic effects of lead. It is an opportunity to begin to discuss a lead poisoning prevention program for the future, because the obvious fact is that our existing system is not working.

While we have dramatically reduced the level of lead in gasoline and have seen a parallel reduction in average blood levels, we have also come to understand that we—and particularly our children—are threatened by lower levels of lead in their blood than we had previously thought. We have failed to develop a coherent program for removing lead from our environment. As the estimates in the recent in the recent EDF report indicated, we are facing what I would have to call an epidemic of lead poisoning. It is right at the top of the hazards that are facing us.

The New England Region of EPA a while back did a hazard assessment comparative risk study, and I will talk about that in a little while when we discuss this problem with representatives of EPA. But I was quite struck by the fact that they place lead poisoning right in the top three of environmental hazards that affect human health, way above some that receive a lot more attention and a lot more funding.

We can't continue to approach this subject in a patchwork fashion, removing lead from water coolers and reducing lead in gasoline and in food and juice cans but not addressing lead in homes or soil. We can't ban lead from solder in new drinking water pipes and from paint as yet unused and not address the lead that is in the paint on our walls and in the drinking water pipes already in our homes. We must begin to examine the levels of lead that children are exposed to in the soil in which they play, and consider how we will protect them when they are in our yards and in our playgrounds.

We still do not really have good data on how many homes have lead paint in them. We don't know which neighborhoods have concentrated lead in the soil. Most of us don't even know if the water coming out of our tap has unacceptable levels of lead in it. The fact is, we must do a systematic analysis of lead in our environment.

The 1988 report by the Agency for Toxic Substances and Disease Registry, Dr. Needleman's most recent reports and articles, and the new EDF report have all given us a genuine basis in fact—not fiction—to be concerned. They illustrate vividly that we must approach lead in our environment in a much more aggressive fashion than we have in the past, and I hope that this hearing will be the starting point for that more coherent, tougher Federal effort to protect our children from lead poisoning.

Thank you, Mr. Chairman.

Senator Reid. Senator Lieberman, thank you.

Ladies and gentlemen, some ground rules. We are going to allow each witness five minutes so that there will be adequate time for questions.

Your full statements, which we have except in rare instances, will be made part of the record. We would ask you to summarize your statement and keep within the five minutes if possible.

The first panel of witnesses is Victor Kimm, Deputy Assistant Administrator for the Office of Pesticides and Toxic Substances of the Environmental Protection Agency, and John Weicher, Assistant Secretary for Policy Development and Research of the Office of Housing and Urban Development.

It is my understanding, Mr. Weicher, that you have someone with you that you would care to introduce, is that right?

Mr. Weicher. Yes, Michael Janis, General Deputy Assistant Secretary for Public and Indian Housing.

Senator Reid. Mr. Kimm, would you proceed?

STATEMENT OF VICTOR J. KIMM, DEPUTY ASSISTANT ADMINISTRATOR, OFFICE OF PESTICIDES AND TOXIC SUBSTANCES, ENVIRONMENTAL PROTECTION AGENCY, ACCOMPANIED BY LESTER GRANT, SENIOR SCIENTIST

Mr. **Kimm**. Good morning, and thank you for this opportunity to speak for EPA before the committee. I will try to summarize my comments as briefly as I can, and my more lengthy statement of the agency's activities is available for the record.

EPA has long recognized lead as a significant health and environmental problem and, in fact, one of the Nation's most toxic multi-media problems. We are particularly concerned because of its potential adverse effects on infants and children, and I would have to add that personally, as a new grandfather, I can identify very much with the remarks that were made earlier about it. It's the kind of problem that makes one stop and think.

Lead itself has a long history of use in our society. Since it is virtually indestructible in the environment, many of our present problems are really dealing with deposits of lead that were laid down long ago before the full significance of that contamination was understood.

Over the last two decades EPA has taken aggressive action, with almost all of the authorities that the agency has, to try to reduce risks and reduce lead exposure. One of our most successful efforts, that has already been mentioned, deals with the virtual phase-out of lead in gasoline. We presently estimate that this has resulted in a 90 percent reduction in emissions in urban areas.

Senator **Reid**. What was that figure again?

Mr. **Kimm**. It's a 90 percent reduction in emissions in urban areas.

Blood lead levels have also dropped significantly as a result of other Federal actions, such as the banning of lead in house paint and the virtual removal of lead solder and lead pipes from drinking water systems, as well as efforts that were undertaken to get the lead solder out of food containers. All of these have had significant impacts in reducing average lead exposures.

However, during this same time frame, this same two decades in which lead levels were in fact coming down, our perception of the risks posed by lead exposure were also increasing as we found much scientific evidence to show us that levels that we thought previously would provide adequate safety do not do that, and in fact, our concern for the levels of lead contamination have come down in recent years and are likely to come down further in the future.

The principal pathways of today's exposure, we believe, are associated with deteriorated lead paint in old buildings, and in dust and soil, especially in urban areas where we think the lead is largely either scaled paint or the fallout from earlier times when leaded gasoline contained far more lead and was far more ubiquitously used.

We also are concerned with the continuing control of point sources, smelters and secondary recovery facilities. We are also undertaking a variety of activities to further reduce these sources of contamination, and most of my testimony really goes to a status report on where we are in the various programs, to try to highlight them as it relates to action under our Clean Air Act activities. We are in the middle of a major review and revision of the ambient air quality standards for lead and the new source performance standards, which will have the effect of further reducing the hotspots—that is, the stationary sources around which we think there continues to be significant exposure.

We also have proposed rules which would deal with the solid waste flowing into incinerators to try to isolate lead and get it out of that pathway of disposal.

Lowering levels in drinking water is a major activity. We have proposed, and are close to finalizing, a reduction in the maximum contaminant for lead in drinking water. We have conducted a fairly elaborate training program to try to alert members of specialized groups, like schools and day care centers, of the potential risks associated with lead exposure. We are also carrying out statutory responsibilities to look for particularly troublesome sources like coolers that contain either lead storage tanks or other facilities that are likely to increase exposure.

We are working with HUD in an effort to mount an abatement program aimed at lead paint. I think the HUD representatives here will describe that more fully, but it is truly a joint venture with EPA. We are trying to support that important effort, as well.

As it pertains to soil, there is come continuing scientific uncertainty about uptake rates, but we have three very large demonstration programs under way with Superfund dollars, trying to relate the efforts to reduce lead in soil to blood lead levels in children in the surrounding areas. We are hoping that those projects, when completed in 1991, will give us a much better understanding of that phenomenon.

Under the Clean Water Act we have major requirements in place for most of the major known dischargers of lead to surface waters. We have included lead as one of the areas of prime concern in our current efforts to establish stringent requirements for the safe disposal of sewage sludge.

Most recently, the Deputy Administrator has asked that programs come together to develop and refine our lead control strategy, trying to look at opportunities to reduce the high end of exposures in the various areas.

Also, we would like to make special note that while most of our present efforts focus on past exposure, we also have an active pollution prevention program being developed. What we are trying to do here is look to the future to try to ensure that unnecessary uses of lead are eliminated, and that we encourage to the maximum extent feasible the safest possible recycling of that lead, which is critical to our ongoing activities.

Senator **Reid**. Mr. Kimm, your time has expired. We have a number of questions that we will ask you. Your statement, as we have indicated, will be made part of the record.

Mr. Weicher.

STATEMENT OF JOHN WEICHER, ASSISTANT SECRETARY FOR POLICY DEVELOPMENT AND RESEARCH, DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, ACCOMPANIED BY MICHAEL JANIS, GENERAL DEPUTY ASSISTANT SECRETARY FOR PUBLIC AND INDIAN HOUSING

Mr. WEICHER. Thank you, Mr. Chairman. Good morning. I am pleased to be able to appear before this subcommittee to discuss HUD's activities in regard to the area of lead-based paint. My testimony will focus on lead paint in housing. I am not here to address the other sources of lead that Mr. Kimm has discussed.

HUD has various mandates for addressing the problem of lead paint in housing. We are pursuing them actively and vigorously. The statutory requirements stem from amendments to the Lead-Based Paint Poisoning Prevention Act of 1971, amendments that are contained in the Housing Community Development Act of 1987, and the Stewart B. McKinney Homeless Assistance Act Amendments of 1988. They cover both the research area and the public and Indian housing program area. In my area, the research area, we are required to undertake a national demonstration to determine the most efficient and cost-effective methods for abating lead-based paint in housing and to develop plans to abate lead paint in both private and public housing.

In the program area, we are required to create guidelines for the removal of lead paint in public and Indian housing. That is the responsibility of Mr. Janis' office, and I may say that in the 10 months that I have been at HUD, my office and Mr. Janis' office have worked closely on our mandates, which are overlapping. We have devoted a good deal of attention to coordinating our work.

In my statement I discuss the status of the specific projects, both the research projects and the public housing guidelines. I might say simply that we are conducting abatement demonstrations in HUD-owned single family housing in five metropolitan areas. That is well under way and we expect to complete that later this year. We expect to spend $6 million on the abatement demonstration, money from the FHA Insurance Fund. This is $2 million more than we originally anticipated. Secretary Kemp has just recently notified the appropriate Congressional committees of a reprogramming request for an additional $2 million. We urge you to support us in that effort. We believe it is essential.

The purpose of the demonstration is to acquire knowledge about the cost of abatement methods, their effectiveness, and the impact on worker safety.

We have an abatement demonstration now getting under way in public housing in Cambridge, Massachusetts, Albany, and Omaha. Initial testing has begun on this. We are addressing the same issues in multi-family housing with FHA as we are in single family housing with the FHA demonstration.

We are examining lead-based paint testing technologies. That is being done for us by the National Institutes of Science and Technology. We have a report describing our progress in that area which is now being drafted which we expect to submit to the Congress later this spring.

The major finding here is not a cheerful one at this point. It is that the most popular detection technology, the portable X-ray fluorescence machine, is not as accurate as we expected. We are requiring supplementary laboratory testing for many units where we have conducted tests with the XRF machine. The additional testing is time-consuming and costly and is one reason why the FHA abatement demonstration is costing more than we originally anticipated. Part of our research effort is devoted to the possibility of developing an improved detection technology.

We are developing comprehensive and workable plans for both public and private housing, which I mentioned before.

In the area of the public and Indian housing program, we have a major effort to implement guidelines for testing and abating lead-based paint. Those guidelines will go into effect by April 1st of this year. They are the result of an intensive effort which began in August, 1988, when HUD contracted with the National Institute of Building Sciences to develop the guidelines.

NIBS, under our agreement with them, ~~convened a~~ broad-based project committee to help them develop the guidelines, composed of public and private sector representatives, including the medical community, design professionals, product manufacturers and distributors, members of the academic community, builders, trade union representatives—everyone with an interest in lead paint in housing in America. Fifty-three people served on the project committee. The committee met through a six-month period to produce a consensus document. The guidelines were transmitted to HUD in March of last year. There was a significant dissenting minority, so during the spring and summer of last year we worked with members of both the majority and minority sides of that committee to develop a set of guidelines with which everyone could be reasonably satisfied.

Concerns were expressed by representatives of the medical community that the guidelines had high implementation costs which would result in little or nothing being done. PHA representatives felt that the document did not provide adequate guidance on how to integrate lead-based paint abatement activities with our comprehensive modernization program for public housing.

Many of the people who worked on those guidelines will be appearing before you later this morning. We worked with the best experts we could find in a variety of areas.

As a result of the revised guidelines, we will have in place on April 1st of this year guidelines covering testing, abatement, worker protection, cleanup, and waste disposal. We are working with EPA on training. We are working with other Government agencies—NIOSH, the Centers for Disease Control, the Consumer Products Safety Commission, Occupational Safety and Health Administration of the Labor Department, as well as the National Institutes of Standards and Technology and the National Institute of Building Sciences—to try to move expeditiously on this problem which we recognize, Mr. Chairman, as a serious problem in the housing stock of the United States. We are committed to respond fully to the mandates which the Congress has asked us to address.

Senator **Reid**. Thank you very much for your testimony.

Mr. Kimm, we didn't give you the opportunity to introduce your associate here today. Would you do that for the record, please?

Mr. KIMM. With me today is Dr. Grant. Dr. Grant is a senior scientist at the agency, and I guess he has been on virtually all of the panels related to lead for the last two decades.

Senator REID. We appreciate that.

We are now going to proceed to questions of this panel.

A question that has arisen time after time, and we have received a variety of answers, is this. Do either of you gentlemen know why we needed lead in paint in the first place, lead in gasoline?

Mr. GRANT. Lead in gasoline was used as a means of boosting the octane of gasoline and making it more effective as far as an antiknock compound——

Senator REID. What did the lead do?

Mr. GRANT. By boosting the octane, the energy——

Senator REID. But how did the lead do that?

Mr. GRANT. I don't know all the specifics exactly, but it facilitated the burning or formation of the combustible materials that interacted with oxygen or whatever.

Senator REID. What about in paint?

Mr. GRANT. In paint, I think it was used mainly as the basis for maintaining the quality of the paint and to resist the loss of color through weathering.

Mr. WEICHER. Mr. Chairman, if I could respond, lead imparted a sheen to the paint which made it look more attractive. It was in large part, as I understand it, an aesthetic improvement in the paint.

Senator REID. One of the real problems we are finding, especially in municipal waste facilities, is lead batteries. It would seem to me that this is a problem that we had better watch very closely, and we're going to have some testimony later today that deals with that. We hope that in the years to come batteries become even more widely used in an effort for storing electricity, solar energy, those kinds of things. That's something we will have to watch very closely, and I will watch today as that evidence develops.

What is the worldwide use of, for example, leaded gasoline and leaded paint? Does anyone know?

Mr. GRANT. Yes. There is a considerable use of leaded gasoline internationally in many different countries. It was commonly used, for example, in western Europe. Only in recent years has the Council of Ministers for the European Economic Community taken a decision to ban leaded gasoline and to establish unleaded gasoline throughout western Europe, and to put catalytic converters on automobiles. This is beginning to take place.

Eastern European countries, most all of them use quite high levels of lead in gasoline.

Throughout South America and most of Asia and so on, leaded gasoline is still widely used, in some fairly high concentrations.

Senator REID. It would appear that from the sources that we've talked about—lead paint, household dust, contaminated soil, drinking water, and so on—it would appear that children are susceptible to lead exposure from these sources. Given what I believe is known in EPA jargon as the "multi-media" nature of the lead problem, could you comment on any difficulties that EPA has experienced in addressing the problem as a result of the agency structure?

Mr. **Kimm**. Your original statement about the absence of a single locus for lead activities obviously is true and accurate. On the other hand, I think we have a variety of coordinating committees and activities across the agency to try to bring these activities together, and we certainly have a community within EPA of scientists and other policy types who are deeply committed to worrying about lead exposure.

So I think that the structure as you describe it is accurate, but I think we have working arrangements inside the agency that, at least in my experience, work pretty well.

Senator **Reid**. Under a memorandum of understanding, the EPA has been working with HUD to address the problem of lead based paint in public housing. You have indicated that you have a good working relationship with HUD—is that true, that I heard you say that?

Mr. **Kimm**. Yes, sir.

Senator **Reid**. How have EPA and HUD divided this responsibility? Or, in fact, have you done so yet?

Mr. **Kimm**. We have worked with HUD in a variety of measures in trying to provide technical assistance, drawing on some of the expertise and similar experiences we have had with somewhat related problems. So we have provided advice on analytical techniques, on sampling, on a variety of other activities in which we have a long background of dealing with.

We are collaborating on some training activities. We have gone back and forth from time to time on roles, but I think that the relationship has been both effective and productive from both sides.

Mr. **Weicher**. I think that's true, Mr. Chairman, if I may speak from the HUD side of this. We have been working closely with the EPA on the curriculum for training and in the application of the guidelines for public and Indian housing. In the period of time that I have been at HUD, I think the relationship has been close and productive.

Senator **Reid**. One last question. It is my understanding that much of the topsoil of the northeast and midwest of this country is contaminated with lead. Is that a fact that anybody has researched?

Mr. **Kimm**. There is certainly contaminated soil in many of our older cities, yes, sir.

Senator **Reid**. And how is the debris from lead abatement to be disposed? Is it general construction waste, or as a hazardous waste? Or is it defined?

Mr. **Grant**. Actually, we're working on clarifying the specifics as to the necessity for disposing of lead debris and soil and so on in the hazardous waste sites. There is a certain criteria for deciding if it represents hazardous material. Some of the bases for making that decision are undergoing some revisions in general terms within the agency, and that's one of the areas that we're evaluating or looking at, to see what's necessary.

Senator **Reid**. I know I've extended my time, but does a building have to be unoccupied for abatement to take place?

Mr. **Weicher**. That's one of the things we're testing in the public housing part of our abatement demonstration, whether or not the lead can be satisfactorily abated without requiring that the building be vacated. We don't know.

Senator **Reid**. And the demonstration projects that you have now, in effect, deal only with 100 units?

Mr. **Weicher**. That's right, in three different sites in three different projects and in three different building configurations.

Senator **Reid**. Senator Lieberman.

Senator **Lieberman**. Thank you, Mr. Chairman.

Senator **Reid**. Excuse me, Joe.

I have a number of other questions that I will submit to you in writing. I would like to ask all of them. I am anxious to get the answers, but we have a lot of witnesses today. We have the Clean Air bill before us, and Senator Lieberman and I have been involved in that. We will have to submit those to you in writing. We will ask that you respond to those within the next three weeks.

Mr. **Kimm**. Surely.

Mr. **Weicher**. Certainly.

Senator **Reid**. Senator Lieberman.

Senator **Lieberman**. Thank you, Mr. Chairman.

Mr. Kimm, in January of 1989 Region I of the EPA, as you probably know, did a New England version of the so-called "Unfinished Business" report that had been done nationally in 1986. I have put their listing of human health risks up there on the chart. I referred to it earlier. I was fascinated by it, and I suppose, troubled by it.

In the highest category they've got ground level ozone, radon, and lead, far above some of the environmental hazards that we spend more to protect ourselves from and to get more attention, such as acid deposition, groundwater contamination, air toxics, asbestos, even Superfund waste sites.

I know that the national report did not include lead, and I want to begin with this question, which is: do you accept that ranking of the threat that lead poses? And in a more general sense, do you accept the sense of alarm that comes out of the EDF report earlier this week of Dr. Needleman's research? Is this a major health crisis for America?

Mr. **Kimm**. Senator, I think there are two questions there.

Lead is a regional problem in New England because of the nature of your water supplies, that tend to be very soft, corrosive, and tend to take lead out of the distribution systems. So in New England lead is a more serious drinking water kind of problem than it is in other parts of the country.

Senator **Lieberman**. That's interesting. That's because of problems at the source, or in our piping systems?

Mr. **Kimm**. Simply stated—I ran the drinking water program at EPA from the mid-1970s to the mid-1980s, but the heart of the matter there is that New England's waters tend to be very soft and tend to be very clean, and for that reason they tend to be corrosive in the pipes of the distribution systems we presently use. For that reason, lead in drinking water has been a concern in New England more than in other parts of the country. So I think you're seeing a perception, at least, of a difference in regions.

Senator LIEBERMAN. So you would not necessarily put lead in that ranking nationally?

Mr. KIMM. I think lead is a serious problem. I don't know that it is as serious across the country as it is in New England, but it certainly is a problem.

In the second question, as I tried to indicate in our testimony, we've been concerned about lead for a long time. What the new science is showing us is that our level of concern has to increase. It is more risky at lower levels than we had previously understood, and for that reason I think we need to go forward with additional controls.

The difficulty is that we are now down to dealing with diffuse sources. The next generation of controls, I think, is going to be complicated and expensive, but I think we need to do that.

Senator LIEBERMAN. Tell me in layman's language what you mean by "diffuse sources."

Mr. KIMM. In the beginning, when we talked about taking lead out of gasoline, it was manufactured and distributed by a relatively small number of entities. And because of the way the automobile industry and catalytic converters were tied to that, that was essentially a fail-safe system. Once it was started, it worked very well, and it was self-policing, if you will.

We now begin to talk about doing something, at least, with lead paint in perhaps as many as 40 million old houses in the United States. We have a very serious and significant problem to deal with.

Senator LIEBERMAN. Isn't that probably also part of the reason why—if I accept your premise, and I have no reason to think otherwise, that New England may have a more intense problem than the rest of the country—isn't part of that due to the fact that we have an older housing stock as well, so there was more likely to be heavy use of lead-based paint?

Mr. KIMM. I'm sure that contributes to it.

Senator LIEBERMAN. Let me go on to something that Chairman Reid and you talked about. Just a few months ago, in December of last year, there was a joint study group on lead established by EPA's own Science Advisory Board. It concluded that the efforts of the various EPA offices working on lead were weakened by inconsistencies between the offices. That joint study group recommended that EPA develop a national policy on blood lead levels and focus on preventing adverse neurological effects in children from exposure to lead.

I have the sense, as you have been testifying, that you are satisfied with the structure and the focus as it exists at EPA. Apparently this board was not. Have you altered your opinion or your practices in response to those conclusions of the board?

Mr. KIMM. I think there have been changes as a result of that. A number of committees—perhaps Dr. Grant, who was involved in that, can give you some more specifics.

Mr. GRANT. I think it is useful to clarify that Office of Research and Development, my inner office, and other associates typically are involved in providing technical support with regard to the scientific evaluations pretty much to all the different program offices that, generally speaking, tend to have a consistency in terms of those underlying evaluations across the offices. That's not always 100 percent the case. There may be some time or another where it isn't exactly consistent.

But certainly, one of the outcomes of the discussions with the Science Advisory Board group has been to try to make them even more consistent. In addition, some of the groups that Vic Kimm just mentioned a little while ago that had been formed in the way of committees and so on, to draw together representatives from different program offices, from Water, from Office of Solid Waste, Air, and so forth, to work together in developing an overall strategy or approach—that has occurred. There are quite extensive activities and, we think, pretty good progress in the direction of developing that kind of national strategy.

Senator **LIEBERMAN**. Do either of you think that there ought to be one lead poisoning prevention office in EPA to coordinate all of the activities?

Mr. **KIMM**. I believe that we are very likely to more formalize that structure in the future, but I think that the detailed program activities, because of the nature of the laws that we administer, very likely have to remain in the basic structure of the agency that reflects the acts that we administer.

Senator **LIEBERMAN**. One of the ways we try to judge how we're doing, for better or worse, is how much we're spending. Do you have any idea how much EPA is spending on lead poisoning prevention programs?

Mr. **KIMM**. We have had specific monies appropriated that are associated with our collaborative efforts with HUD that included $500,000 in 1989 and $5 million in 1990. There are other activities inside the agency which we will be happy to identify for you, but we'll have to submit that for the record.

Senator **LIEBERMAN**. So as of this point you can identify approximately $5.5 million of spending?

Mr. **KIMM**. Absolutely.

Senator **LIEBERMAN**. And would you say it's considerably more than that in other elements?

Mr. **GRANT**. If you take into account the program office efforts for development of lead regulation and implementing those regulations, the enforcement actions, it is probably a rather sizeable amount of money.

Senator **LIEBERMAN**. Okay. I would be very interested in receiving your response to that in writing, because obviously this is an enormous problem. I know that $5.5 million is only a partial answer, but that's a minuscule amount of money compared to what we're spending in other areas.

Mr. **KIMM**. We'll be happy to submit that.

[The information referred to follows:]

Question. Do you have any idea how much EPA is spending on lead poisoning prevention programs?

Answer. EPA's efforts to reduce lead in the environment cut across several programs and media, including the Office of Drinking Water, the Office of Solid Waste and Emergency Response, the Office of Pesticides and Toxic Substances, the Office of Air and Radiation, and the Office of Research and Development. The resources budgeted in these offices for lead activities total approximately 49.7 workyears and $10.8 million in 1990 and 49.2 workyears and $9.4 million in fiscal year 1991.

1(a) *Question*. So as of this point you can identify approximately $5.5 million of spending?

Answer. The $5.5 million figure represents the OPTS portion of EPA's lead activities for 1989 and 1990.

1(b) *Question.* And would you say it's considerably more than that in other elements?

Answer. The OPTS budget for lead activities represents about 30% of the workyears and dollars in 1990, and about 30% of the workyears and 12 percent of the dollars in 1991.

Senator LIEBERMAN. Mr. Chairman, I know we want to move on. If I could try just one broadside question of Mr. Weicher. I'm used to throwing broadsides at people named Weicker. [Laughter.]

As you look at the record, a skeptic might say, why has it taken HUD—and I know this is not your fault personally, so I ask it with understanding—but if the original directive from Congress to HUD occurred in 1971, why has it taken them until 1990 to develop definitive guidelines about what HUD should be doing? What happened along the way and what is going to happen now to make it move quicker?

Mr. WEICHER. I think there are a couple of things that happened. If you look back at the legislative history, there is a period from 1971, with the Lead-Based Paint Poison Prevention Act, to 1978, during which Congress and the Consumer Products Safety Commission and the Executive Branch in general were wrestling with what the standards should be, and the standards were lowered for the amount of lead that was permissible between 1971 and 1978.

Between 1978 and 1987, I really don't know what the delay was on that. There may be some specific information that we can provide to you. I do know that in response to the McKinney Act and the 1987 Housing Community Development Act, when Congress said that you were not satisfied with the rate at which we were addressing the problem, serious efforts have been made. In my office, we have a $1.4 million contract to conduct the research that I described in my statement. That is not an enormous amount of money, but it is a pretty large share of my research budget. It is 20 percent of the funds which are allocated to PD&R which are not required to be spent for basic data to support the department's programs.

Senator LIEBERMAN. Again, to me it doesn't sound like—and this is not your fault—enough money to deal with the problem as we are hearing it described.

Just one final question. Do you think this is an appropriate role for HUD, or should all of this prevention and cleanup be placed somewhere else? For instance, in EPA, since this is an environmental problem we're talking about?

Mr. WEICHER. No, I think we have a role here, and I think it's a significant role, insofar as our concern is with lead-based paint in housing. We are the agency which is responsible for housing and for assisted housing, for housing that is occupied by low income people, and indeed the outcome of the lead poisoning prevention efforts will be extremely important for the programs that we administer. Much of the work that will be done to abate lead in public housing will be done as part of our overall comprehensive modernization efforts in the public housing stock, efforts on which we spend $1.5 billion to $2 billion a year, and we are working off a backlog of modernization needs. We have asked in the fiscal year 1991 budget for $2 billion instead of the usual $1 billion for comprehensive modernization. I think it makes sense for us to have that responsibility, and I think we can work with EPA and with other agencies.

Senator **Lieberman**. Okay, I appreciate it.

We will submit some more questions.

I just want to point out that I appreciate what you're doing in public housing, but it obviously leaves the whole private housing stock for us to figure out what to do about.

Thank you, Mr. Chairman.

Mr. **Weicher**. That's the purpose of the comprehensive plans which you, the Congress, have asked us to prepare.

Senator **Reid**. Thank you, Senator Lieberman.

Gentlemen, thank you very much.

The second panel will consist of Dr. Herbert Needleman, University of Pittsburgh, on behalf of the American Academy of Pediatrics; Dr. Vernon Houk, Centers for Disease Control, to be accompanied by Dr. Barry Johnson, the Assistant Administrator of the Agency for Toxic Substance and Disease Registry; Dr. Kathryn Mahaffey, National Institute of Environmental Health Sciences, Department of Health and Human Services; and Dr. Robert Bornschein of the University of Cincinnati.

Lady and gentlemen, we are grateful for your appearance here today. The first person to testify at this hearing will be Dr. Herbert Needleman. As I indicated to the other witnesses, we have your statements. We will make those part of the record and we would ask that you keep your oral statement to five minutes so that we have adequate time to ask questions.

Dr. Needleman.

STATEMENT OF DR. HERBERT NEEDLEMAN, M.D., UNIVERSITY OF PITTSBURGH, ON BEHALF OF THE AMERICAN ACADEMY OF PEDIATRICS

Dr. **Needleman**. Good morning, Mr. Chairman. I am Professor of Pediatrics and Psychiatry at the University of Pittsburgh and a member of the American Academy of Pediatrics. I am grateful for this opportunity. I have submitted my testimony for the record, and two papers recently published by my group that deal with the subject under discussion.

I would like to make three points.

The first is that this is the most serious pediatric problem in the United States today.

The second is that it is totally preventable.

The third is that in preventing it, we can accomplish enormous social good in other areas.

Senator **Reid**. Dr. Needleman, I don't want to interrupt at this stage, but I'm going to. I've heard you say that before. Would you repeat that?

Dr. **Needleman**. It is the most serious pediatric problem in this country. I don't know of any other serious neurologic or biomedical problem which has a prevalence of 16 percent. I have searched my memory and cannot find anything of that magnitude and that frequency.

For the past 30 years there has been a raging debate about whether small amounts of lead cause cognitive impairment, but I think that debate has been effectively settled. There has been an explosive amount of new information in the past five years, and in the paper from the JAMA, the Journal of the American Medical Association, that I submitted, there is a mathematical synthesis by Dr. Gatsonis of Harvard and myself which shows that of the 24 modern studies, the combined inference is unarguably that low levels of lead damage the brain, levels in the range we're talking about, 15 micrograms per deciliter.

The only people who now contest this assertion are the lead industry and its academic representatives. In 1979 we showed, in Boston area school children from two white working class towns, that having elevated amounts of lead in one's teeth, but no symptoms, were associated with a whole bunch of neuropsychologic problems, lower IQ scores, etc. This chart shows how teachers in Somerville and Chelsea Grammar Schools evaluated children in relation to their amount of tooth lead. The teachers did not know how much lead was in the children's teeth, but reported that as tooth lead increased, there was an increase in the rate of bad classroom behaviors, distractibility, impersistence, disorganization, inability to follow directions, and overall classroom function. This study has been replicated in Lavrion, Greece, and in South Africa, and other lead-related attentional disturbances have been shown in many other areas of the world now.

We followed these children up. They are now adults. We reported this in the New England Journal of Medicine in January. The news is very bad. The effects that we found and reported in 1979 are permanent, and are expressed not just in IQ points but in real life behavior: graduation from high school; ability to read; vocabulary. These influence how much money a person will make and where they will position themselves in society. It is a very serious problem, and it is also a completely preventable cause of academic failure.

The next two slides are graphs from that paper that show that as tooth lead in 1976 went up, the rate of failure to graduate from high school went up in dose-dependent fashion, as did reading disabilities and the other behaviors that we didn't talk about.

I want to pay attention to another ignored aspect of lead exposure. On the final graph, here I plot the actual frequency of IQ scores in high and low lead groups. The low lead group is the S-shaped curve on the right, the high lead group on the left. We see a shift in the median scores of about six points, but that means that there is a 400 percent increase in severe deficits. Down at the bottom of the chart, the rate of IQ scores below 80 goes from 4 percent to 16 percent, so that small difference is expressed a fourfold in severe deficits.

Now let's look at the top end of the curve. Let's look at the IQ scores at the top. You see that shifting this curve deprives 5 percent of American children from achieving superior function. That's a social disaster. It means 2 million American children who might have been gifted, are deprived of achieving that level by their exposure to lead.

We have shown that lead is associated with hyperactivity, and hyperactivity is a severe risk factor for antisocial behavior. We are looking into that outcome at this time.

We are forced to ask why this disease, which has been known for a long time, has received so little serious remedial effort. There are at least three reasons:

The first is that it has been believed to be a disease of poor minorities, and that somehow gets transformed into blaming the mother for poor care for her child. Once the victim is blamed, then the public conscience goes to rest.

The second is that the lead industry, who has had to pay the costs for control of lead in gasoline, for example, has exerted itself mightily to obscure this relationship between lead at low dose and psychological deficit.

And finally, this is not a dramatic disease. It does not have the charm of lasers or of liver transplants, etc., and my colleagues in pediatrics tend to seriously underestimate its importance.

If one were to map the area where lead is found in superabundance, and draw another map of where decent jobs are in short supply, and a third map of where housing is in short supply, the three maps would be virtually identical.

How would you rationalize this kind of disequilibrium? Well, you might say, "Why don't we train the unemployed in safe deleading, and pay them? The money spent would thereby reduce unemployment and return houses to decent circumstances, and we could wipe this disease out." If that sounds utopian, because we're talking about $10 billion, you should know that the cost of building a new prison bed—you probably do know—is $100,000, and high security room and board is about $30,000 a year.

Lead poisoning is no mystery. The toxin's presence, its effects, and the steps to removing it forever are plainly prescribed. What is needed is the same kind of vision displayed by the people from DHHS when they set out to eliminate smallpox from the earth. At that time they were greeted with skepticism, and now smallpox is a disease of historical interest. This Government, given the same degree of vision and commitment, can in a decade be credited with having wiped out this terrible, ubiquitous, silent destroyer of children's brains and futures.

Thank you.

Senator **Reid**. Dr. Needleman, if you would remain, we have questions that we want to ask you.

Dr. Vernon Houk of the Centers for Disease Control.

Dr. Houk.

STATEMENT OF DR. VERNON N. HOUK, M.D., CENTERS FOR DISEASE CONTROL, ACCOMPANIED BY: BARRY JOHNSON, ASSISTANT ADMINISTRATOR, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Dr. **Houk**. Good morning, Mr. Chairman and Senator Lieberman. I am Vernon Houk from CDC. Accompanying me this morning is Dr. Barry Johnson, the Assistant Administrator of the Agency for Toxic Substances and Disease Registry, who recently delivered a report to Congress which I'm certain you have read. I commend it to your reading.

I have been deeply involved since 1972 with this issue and the passage of the Lead-Based Paint Poisoning Prevention Act—not only deeply involved, but personally committed to it and exasperated with our progress so far.

I would submit that had we all worked together in 1972, there might not have been reason for this hearing today. We could have solved the problem by then instead of saying that it is too expensive to solve.

To repeat what Dr. Needleman said, lead poisoning remains the most common environmental disease of young children. It is the most societally devastating. I can't think of anything more devastating in a population of children with no superior intelligence and no geniuses, and more importantly, it is totally preventable. In the United States millions of children from all geographic areas—it is not a northeastern disease; there is no magic curtain at the Mississippi River that keeps it up in the northeast—and from all socioeconomic strata have blood leads high enough to cause serious adverse health effects. However, the poor minority children in inner cities who are already disadvantaged by poor nutrition and other factors are most vulnerable to this disease.

Lead is also an important concern for the worker—not only the health of the worker, but the health of the worker's children and the health of the fetus. Lead affects every system in the body. It is particularly harmful to the developing brain. The most serious effects are irreversible, and children with moderate levels have markedly increased school dropout rates, decreased ability to learn, difficulties with reading, and neurobehavioral abnormalities. We don't need any fancy statistical models to demonstrate the effects of lead, just the numbers of children who don't finish school should do it.

It is not a disease primarily of public housing. It is a disease of all housing. The Lead-Based Paint Poisoning Prevention Act states that it applies to housing with Federal assistance in any form—and I will submit that includes most of the housing in this country.

In the categorical grant days we had a program with 100 communities in 40 States. We identified more than a quarter of a million children and provided care for them, both medically and environmentally, to prevent the disease from occurring. That was folded into the block grant, and we don't know very much of what happened since them. Since the passage of the new legislation, a couple of the important things that we are doing are beginning the demonstration grant program, which we think will be in about six States in some communities this year, but most importantly, we are developing a strategic plan for the elimination of childhood lead poisoning within the next 20 years.

Senator Reid. The next how many years?

Dr. Houk. The next 20 years. This will be done within the broad context of the private and governmental sectors, both Federal and State, to see if we can't get on with the task of doing this. We are due to deliver this to the Assistant Secretary for Health on the 5th of August.

This is an area in which we don't need a lot more research. We know what to do, and we need to get on with doing it. We need some national surveillance of how much of it is going on.

In conclusion, the activities that are being done today are an important step—although a first step—toward ensuring that children are not being adversely affected by lead. However, after nearly two decades of effort, we know that without lead abatement, mass screening and public education, while important, are not enough to eliminate this disease. The key to eliminating childhood lead poisoning is to prevent the exposure that causes it. For most lead poisoned children, this means removing lead-based paint. The greatest impediment to preventing this disease is the high cost of removing lead-contaminated paint in older housing and paint-contaminated dust and soil around this housing. However, we are working with others who will be part of the plan that we are developing for this.

I would say that we can do this, we can do it without the astronomical costs, and if we are innovative, we can do several things. As an example, for your daughter, the Internal Revenue Service has ruled in its Ruling 78-16 or 76-18, which we were instrumental in getting, that the removal of lead-based paint from a home with a child that may be affected is deductible as a medical expense provided it is ordered by a physician. We had hoped to get a tax credit, very much like weatherization, but that so far has not come out.

But there are all sorts of methods that we can use to deal with this if we are innovative that will not break the Federal Treasury to get rid of this particular problem, and all the dollars don't need to be Federal dollars.

Senator Reid. Dr. Houk, thank you very much.

Dr. Kathryn Mahaffey.

STATEMENT OF DR. KATHRYN MAHAFFEY, NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES, DEPARTMENT OF HEALTH AND HUMAN SERVICES

Dr. Mahaffey. Good morning, Mr. Chairman. I am a research chemist with the National Institute of Environmental Health Sciences, which is part of the National Institutes of Health.

NIEHS has maintained a very active program of biomedical research on the effects of lead. I should add that the NIEHS has maintained this program over the decades when many indicated that they felt that we knew all that was needed about the abuse health effects of lead.

During fiscal year 1989, NIEHS funding of about $7 million supported 34 individual and center grants that had a component of lead research as part of their activities. In addition, we have contract research on transfer of lead from the mother to the infant during pregnancy. We are also looking at the bioavailability of lead from environmental sources, such as lead ores.

Although lead exposures have declined, impairment of child development has been identified at progressively lower levels of lead exposure. This is occurring at concentrations where we had previously thought would not have harmful effects.

Two of the NIEHS-sponsored longitudinal studies of child development were conducted in Cincinnati and Boston. These two studies are an interesting contrast because in the case of the Cincinnati study, the group that was part of the ongoing evaluation was of inner city children from low socioeconomic status families. The Boston study was of children from upper income professional families. What is interesting and remarkable in its own way is that both groups, despite very different patterns of lead exposure, showed similar effects of lead on the development of the child.

In the Boston study, infants with umbilical cord blood lead concentrations of 10 to 25 micrograms of lead per 100 deciliter of whole blood showed about a four to eight point decrease in performance intelligence between the ages of 6 months and 24 months when you compared the scores of these children with others whose blood leads were low, under three micrograms per the same unit of whole blood.

In the Cincinnati cohort, the developmental scores at 3 and 6 months of age were six to seven points lower for each 10 microgram increase in lead during the prenatal period. These effects occurred at much lower blood lead concentrations than ever anticipated. I should emphasize that such concentrations were typical of the urban pediatric population only a decade ago.

To put some of this in perspective, because sometimes these micrograms per deciliter are of hard to put in perspectives, it is useful to remember that if a young child, say a two-year-old, has a blood lead concentration of about 150 micrograms, that quantity can be fatal to the child unless the child is hospitalized and appropriately treated. In the 1960s we knew so little about the continuum of lead effects that blood lead concentrations that were 40 percent of the dose that can be fatal were accepted as the recommended level for public health intervention. The concentrations that we are now concerned about, about 10 micrograms per deciliter, are roughly 7 percent of a potentially fatal dose to a young child.

Elevated lead exposures are common among children in highly urbanized areas. Figures of around 17 percent of children between six months and six years of age have been cited. Exposure to lead is, in a substantial way, an urban problem. Data from the ongoing study in Cincinnati are showing that 22 percent of the children in that study had blood leads over 25 micrograms per deciliter by the time they were about two years old. Three times that number, 75 percent of the group under study, had blood leads above 15 micrograms per deciliter by the time they were 27 months of age.

Basically, this is only the tip of the iceberg because we know that the children in these cohorts are much better followed than children who do not receive this degree of attention and medical intervention.

I know my time is short. We particularly want to emphasize that lead during pregnancy is a major problem. Lead readily crosses the placenta. It is estimated that over 400,000 infants are born each year with a blood lead over 10 micrograms per deciliter.

Senator **Reid**. How many?

Dr. **Mahaffey**. Over 400,000 infants per year.

We know that the lead stored in the mother's bone can be transferred to the fetus. This particularly happens when the supply of dietary calcium to the mother is short. The maternal bone can be reabsorbed in order to provide calcium. Along with this comes lead, that is very readily available for transfer to the developing fetus.

We also know from the studies in Boston and Cincinnati that the effects of prenatal lead exposure are persistent. The studies in Cincinnati have shown that by age 3, the child's likelihood of passing all the tests of speech and language development decrease from around a 65 percent chance of passing all these tests when the mother's blood lead was under 5, to only around a 10 percent chance when the mother's blood lead was about 15 micrograms per deciliter to 25 micrograms per deciliter. This same group of children are also showing impaired growth rates and difficulty with balance. These measurements are conducted when the children are at the ages of about 5 and 6. We believe that this identifies some of the persistence of the effects of prenatal lead exposure.

Thank you very much. I would be pleased to answer questions.

Senator REID. We will have some for you.

Dr. Bornschein.

STATEMENT OF DR. ROBERT BORNSCHEIN, M.D., UNIVERSITY OF CINCINNATI

Dr. BORNSCHEIN. Good morning, Mr. Chairman, members of the committee. I am an Associate Professor of Environmental Health at the University of Cincinnati School of Medicine. I am currently co-directing two large, federally-funded research projects investigating childhood lead exposure. The first of these was mentioned earlier this morning, funded by EPA, a soil lead abatement demonstration project.

The second of these projects, now in its 11th year, is a study of about 300 children born in inner city Cincinnati between 1980 and 1985. This study is funded by the National Institute of Environmental Health Sciences. One of the objectives of the study is to identify pathways by which children become exposed to lead. This study includes repeated measurements of lead in and around the children's homes, with particular emphasis on the measurement of lead in paint, exterior surface dust, soil, and house dust.

The 300 children in our study are largely from low income minority families. Their homes are primarily 19th century buildings in various states of repair, ranging from full rehabilitation to extensive deterioration. Three-fourths of these buildings still contain lead paint. Over one-fourth of the homes have dangerous amounts of lead in paint.

The surface soil around these buildings is also badly contaminated with lead from paint which has weathered, chalked, chipped, peeled away, and eventually fallen to the ground. Once there, the weathering process continues until the paint chips are converted into a fine dust. The average amount of lead in the surface soil and dust around these homes is over 5,000 parts per million.

Soil which is uncontaminated by man's activities is generally around 20 parts per million. Thus we have over a 250-fold increase in the level of contamination around these homes with lead-based paint.

This contaminated surface soil and exterior dust serves as a large reservoir of lead which continually blows around the neighborhood, gets tracked indoors on shoes, carried in by house pets, or blows in through open doors or windows. Once inside in the form of a lead-contaminated house dust, it poses an immediate threat to the infant or toddler as they crawl around on the floor, get the lead-contaminated dust on their hands, and then put their hands or lead-contaminated toys in their mouths. Unknowingly, and unrecognized by the parents, they are ingesting a poison.

Children reared in these homes experience a quadrupling of their blood lead in their first year of life, from about 4 micrograms per deciliter at birth to about 18 micrograms per deciliter at 1 year of age. Even children living in lead paint abated housing have higher than expected blood lead levels due to the presence of lead in soil and street dust in these neighborhoods.

Lead-based paint is the source of greatest concern in our older homes. However, lead in the form of dust is the manner in which it migrates and the form which poses the greatest risk to the greatest number of children. The full benefits of abating lead paint will not be realized if lead-contaminated soil and dust remain to recontaminate the lead paint-abated dwellings.

We have direct experience with this problem in Cincinnati. In the late 1960s, over 6,500 dwellings were fully rehabilitated to provide low-income housing. The interiors were gutted and then reconstructed, with the result being that all woodwork and lead paint were removed, thus creating lead-free interiors. Unfortunately, the rehab process also included sand blasting of the exterior brick surfaces to remove the old paint. That lead ~~paint remains~~ today in the form of a heavily contaminated soil that surrounds each of these rehabilitated dwellings. Levels of lead in the house dust of these rehabilitated, lead paint-free homes are twice as high as those found in other urban housing. Children growing up in these homes have average blood lead levels that are three times higher than the current national average.

We have also found that carpets and fabric upholstery in these homes are heavily contaminated with lead dust. This reservoir of lead is extremely difficult to remove. If unabated, it will remain as a continuing source of lead exposure, and attenuate the expected benefits from lead paint and soil abatement. We are currently exploring a number of techniques to remove this lead dust.

I would like to close by drawing your attention to a subtle but important distinction between the characteristics of lead found in urban soils, and that found around lead mining and milling sites. Lead in urban soil exists in the form of very small particles which readily adhere to children's hands and are readily dissolved and absorbed into the body. On the other hand, lead found around old mining and milling sites is usually of geologic origin, usually of larger particle form, and in a form not readily dissolved by the stomach.

Our studies at such sites have found children's blood lead levels to be well below the levels predicted simply on the basis of the concentration of lead in soil. The risk arising solely from exposure to lead of geologic origin thus appears to be substantially different from that associated in the urban exposure situation. More research is needed to understand how particle size and chemical species influence this risk. However, there can be no doubt that the current levels of lead in urban inner city soil and dust are resulting in the unnecessary exposure of millions of children.

Thank you.

Senator **Reid**. Thank you, Dr. Bornschein.

The testimony of each of the witnesses is dramatic and interesting.

Senator Lieberman, what we are going to do is have a couple of rounds of questions. We have four witnesses here, so I think that would be the best process.

Dr. Needleman, tell us in layman's terms why lead hurts children. We know that it affects their learning abilities but why? How does it affect them scientifically?

Dr. **Needleman**. In the central nervous system, there are a number of different mechanisms that have already been demonstrated. At high doses, it causes brain capil[illegible] to leak and you get swelling of the brain.

Senator **Reid**. What does lead do? Why does lead cause that?

Dr. **Needleman**. Well, it damages certain enzyme systems that have to do with calcium and protein transport, so that you get leaky capillaries just as if you had a bruise. It interferes with transport across the blood brain barrier, which is a physiologic mechanism. High dose lead exposure—a long time ago I've treated children who had that. They had swollen and sometimes hemorrhagic brains.

Senator **Reid**. How did you first get interested in the subject of lead exposure?

Dr. **Needleman**. I was a pediatrician in inner city Philadelphia, Children's Hospital of Philadelphia, a chief resident in pediatrics there.

Senator **Reid**. And the same symptoms occurring in children? Is that why you got interested?

Dr. **Needleman**. In those days, in the late 1950s, we were seeing frank lead poisoning, vomiting, staggering, seizures, and convulsions. The first child I treated for that, I remember that I felt quite smug that I had done a good job. I told the mother that she had to move out of that house and find someplace that didn't have lead in it. She just looked at me and said, "Where am I going to move?" I suddenly realized that my little bag of medical tricks was very ineffective, that this was a societal problem that had to do with the kinds of housing available to people who were poor in South Philadelphia.

Senator **Reid**. Dr. Needleman, how are your conclusions accepted by the rest of the medical community? The treatises and papers you have written, how have they been accepted by the academic and medical communities?

Dr. **Needleman**. Well, I think that the past few years has witnessed a radical change in consensus. I think this is fair to say, that there are no informed people who don't have a vested interest—that is, grantees or consultants of the lead industry—who disagree with the thesis that very small amounts of lead damage children's brains. This is no longer considered just an American problem. We have extraordinarily good studies from Scotland, from Germany, from Greece, from Australia and New Zealand that all converge on the same conclusions. So the picture has changed.

Now, within the pediatric community there still is an appalling amount of ignorance about lead exposure, however, not quarrelling with the thesis, but just ignorance about the new facts.

Senator **Reid**. It's my understanding that the EPA criticized your first study. Is that true?

Dr. **Needleman**. Well, it was their job to review all the studies extant, and during the standards setting they set a special committee to review mine and those of another investigator. Then the Clean Air Science Advisory Board of EPA said that my stuff held up under close examination.

Senator **Reid**. If you had to list the rank of the sources of lead exposure, what would you tell the committee? What are you going to tell us, because that's the question I'm asking?

Dr. **Needleman**. Well, paint. Unquestionably, paint, and through the pathway of dust, it is undoubtedly the most serious source for children.

I've been in many homes—I'm the medical director of the screening program in Allegheny County, and I have gone to homes where there are whole families of children with high blood leads. These children are living in a sea of lead, a sea of lead dust.

Senator **Reid**. And if you had special glasses that would pick up the lead spectrum, you could see it, couldn't you?

Dr. **Needleman**. Oh, yes, right. Oh, yes.

Senator **Reid**. Dr. Houk, I was extremely impressed with your testimony for the reason that you are saying what I see around here all the time. We have had enough studies. Let's get on with doing something. We know there are risks. Dr. Needleman has explained the risks involved. Dr. Mahaffey has explained, even in layman's terms that we can understand, that we have a problem in conveying the lead during the months of pregnancy. So I was impressed with the fact that we have done enough studying, let's get to work on it.

It seems to me that housing with lead-based paint might also have lead plumbing, especially if we're talking about older houses. You've indicated that this isn't a problem that relates to the northeast, it's a problem that relates to every place, and I've given you some statistics from Nevada. Especially in southern Nevada, almost everything is new there, but yet in testing the children there, we find that they have high lead exposure.

So would you confirm the fact again that it is not a regional problem?

Dr. **Houk**. I think it is not a regional problem. The data that you used for Nevada, I don't know where it came from. I suspect that was from the study that was done from 1976 through 1980.

The removal of lead from gasoline—which I had something to do with, I like to think, as my proudest public health accomplishment—in 1976, the mean blood lead of children in this country was 15 micrograms per deciliter. In 1990, it is very likely between 5 and 6, and that is the result of getting lead out of gasoline, from the background levels. That doesn't mean we've solved the problem because we still have the high dose sources, which is principally paint and dust and soil.

I believe on the water issue, we need to take a very careful look. I'm not sure how much that contribution is.

Senator **Reid**. Doctor, if we still used leaded gasoline, with multimillions of additional cars that we have in our society, it would be a significant problem?

Dr. **Houk**. It would be a lot worse than it is now. When one looks, for example, at Mexico City, the mean blood lead in children in that city is about 30 micrograms per deciliter, a figure that no one would disagree with is catastrophic to children.

The story of lead in gasoline is not a proud story. That has been reviewed very recently, and if you would like, Mr. Chairman, I will submit that. It's a published paper in the American Journal of Public Health, which goes from 1926 through 1980.

Senator **Reid**. We would like to have that.

Dr. **Houk**. You might ask why, until 1970 when EPA developed the catalytic converter—and incidentally, getting the lead out of gasoline was not for the protection of a child's health, it was for the protection of the catalytic converter—until the advent of the catalytic converter, no one in the general public had ever heard of leaded gasoline. We called it that good old ethyl, the good old high octane that we got in there. It was only when we went to the phase-down of leaded gasoline that the public became knowing about lead in gasoline. Between 1926 and 1980, we widely dispersed through the environment of the United States 5.5 million tons of lead through gasoline. We are now paying the price for that.

Senator **Reid**. Can anyone on the panel explain to me whether or not this "chelation therapy," this cleansing of the blood, works?

Dr. **Houk**. Chelation will take lead out of children, but it also takes a lot of other things out of children and is dangerous.

Senator **Reid**. Dr. Needleman, what is your feeling about that?

Dr. **Needleman**. There is no doubt it saves lives. Children used to die from high level lead poisoning, and it dropped the mortality rate from something like 30 percent down to about 5 percent for the very high ones. Whether it does anything to prevent minor brain damage, we just don't know. There's only one study extant on that subject.

Senator **Reid**. Senator Lieberman.

Senator **Lieberman**. Thank you, Mr. Chairman.

I want to thank all of you, not only for your testimony but for the work you've done. As is appropriate for these discussions, we proceed in thoughtful tones, civil tones, but I have to tell you that as I sit here listening to you, the words you are saying are screaming up at me because just as you said so clearly, this is a widespread and—as two of you said—the most prominent, the most serious, the most comprehensive pediatric health problem in America today. It is preventable, and we've done nothing about it.

I hope you won't think I'm overstating this. As I've been listening to you I've been having the sense that you're like a group of Biblical prophets who were trying to call people to their senses. I hope we will look back and say that we responded at some point.

The other thing that strikes me as I listen to your testimony, and the work that you've done, which I've read in preparing for this morning, that you've really broken through what I think is still a widely-held misunderstanding and a stereotype of what this problem is all about. I think the stereotypical understanding in our society is that lead poisoning is basically a problem limited to poor kids, usually minority kids in inner city neighborhoods, and they get it from eating chipped paint.

Well, you are suggesting that it is much more widespread in the population and much more insidious in the sense that the kids are getting it, basically, in the air, in a way that we can't see, in lead dust that is in the air. I just hope that we will be able to carry forth from here the sense of seriousness and crisis and outrage and hopefully generate some support here to give you the kind of help that you need to make this better.

I can't resist asking this question in terms of the effect on people. You mentioned the social consequences. One of the problems that we talk about here in Congress over and over again now as we worry about—we come at this through a different door—we worry about America's position in the world economically, economic competitiveness. We keep coming back to our poor quality of educational system.

Is it fair to conclude—and I don't want to push you to this—that you would say, based on your work, that lead poisoning is a substantial contributor to the high dropout rates in our country from schools, a contributor to some of the lower educational performance that we see here as compared to other advanced industrial countries in the world?

Dr. HOUK. I think the data strongly indicates that that's true, strongly indicates it.

Senator LIEBERMAN. Would anybody on the panel disagree with that?

Dr. HOUK. I think, Senator Lieberman, that that data is controvertible, with Dr. Needleman's latest follow-up of those.

One of the things that we've faced for a long time in this issue is that Dr. Needleman and I and a few others who have been on this issue for a long time used to be laughed at. "Why in the hell are you worrying about that when kids aren't dying over it?" We stopped the death. We haven't stopped the major consequences.

Senator LIEBERMAN. So were the prophets, incidentally.

Dr. HOUK. I think also it needs to be pointed out, sir, that your actions when you were the Attorney General of Connecticut have also had a very substantial influence in preventing a lot of lead poisoned children in that State.

Senator LIEBERMAN. Thank you. I'm not sure they thought I was crazy in Connecticut, but thank you for saying that.

Dr. HOUK. Oh, I don't know about that. [Laughter.]

Senator LIEBERMAN. It's a different feeling here in Washington.

Dr. Houk, let me ask you this. Earlier this week, after the EDF report came out, we had a call from a woman in Connecticut, a grandmother who got worried about her grandchildren and was troubled that she was unable to find a lead poisoning screening program in her community.

Do you think that one of the things that we need in order to deal with this problem is a national screening program of some kind?

Dr. HOUK. Absolutely. Particularly, one of the most important players with us in this effort is the Department of Agriculture's Women, Infant, and Children Program. They have done a lot in that thing. It is my view that with something with this frequency, and with the relatively inexpensive nature of the testing, children—particularly in high risk areas—ought to be routinely screened for absorbing too much lead. Then the environment needs to be looked at to see where that is coming from. In my view, that's the only way that we're going to get at it.

What we are doing, in essence, until we start systematically removing the lead from our environment, we are using our children as the "sentinel pheasant" of our cities to demonstrate that there is a problem, and I don't think that's very fair.

Senator **LIEBERMAN**. You are absolutely right.

Dr. Needleman, to what extent are pediatricians in their normal caring for children in this country testing for lead poisoning?

Dr. **NEEDLEMAN**. They don't. It's a terribly neglected area. A blood lead test should cost about $12, and the bang for the buck is very high.

I have been unsuccessful at my own institution, where I am a senior member of the staff, in getting them to do that, and I've been banging away at that for a long time.

The belief is that it is not a problem for middle class families, and as a result it's not done. Many people call me on the phone and ask me how they can get their doctor to pay attention to this question.

Senator **LIEBERMAN**. How can we?

Dr. **NEEDLEMAN**. Well, that's one of my functions, to educate people. We are forming a private organization to be housed in Washington which will attempt to bring this news to educators, people in the criminal justice system, urbanologists, and pediatricians, but we have to begin with pediatricians.

Senator **LIEBERMAN**. Dr. Houk, did I understand from something that you said earlier that nutrition can play a role in the impact that lead poisoning has on a given individual?

Dr. **HOUK**. Very much so, Senator. The child who is poorly nutritioned, particularly with iron deficiency and calcium and various sorts of things, will absorb more of the ingested lead than children who are not. That's the reason a very important player in our childhood lead poison prevention programs is all of the medical community, and particularly the WIC Program, feeding the poor children, providing them food supplements. Screen them at that time. If they have a problem, try to find the source of the lead. They come back through repeated screening through that effort.

Senator **LIEBERMAN**. So if this problem, as I believe I hear you saying, may be somewhat more prevalent among poorer populations, although the threat is widespread, part of that reason is the poor nutrition and poor diet of poorer kids?

Dr. **HOUK**. Yes. There are rural areas of this country where contrasts have been done before and after an effective WIC Program was instituted there, and there were substantial reductions in the mean blood lead level of those populations of children.

Senator **LIEBERMAN**. I have gone over my time, Mr. Chairman.

Senator **REID**. Dr. Bornschein, I thought your statement regarding lead in soils was illuminating. In the long term, how do you think we can deal with the problem of lead contamination in soil?

Dr. **BORNSCHEIN**. The problem is multi-faceted, and it will vary from one community to the next as to whether the soil has to be totally removed or whether it will be possible to find some other means of removing the soil, other than digging it up and replacing it with clean soil.

For example, in some communities the soil is very sandy and silty, and the lead will penetrate down to great depths, 12 to 18 inches in the soil. In other areas, such as Cincinnati, we have a lot of clay and the lead is right up on the surface.

Senator **Reid**. Does grass help, for example?

Dr. **Bornschein**. Grass will interrupt the pathway. That is, it will keep the soil from being tracked into homes or it will protect the child from coming into direct contact with it. That does not necessarily alleviate the problem in the future, though. It may be a short-term interruption of the pathway, but there is no guarantee that in the future that area won't be used as a garden, or that traffic across that area won't wear down the grass and once again reexpose the soil.

Senator **Reid**. Dr. Mahaffey, your statement regarding babies, the food that mothers should eat—you talked about calcium depletion, or words to that effect. What do you think the Federal Government could do to promote good nutrition? It appears, as has been indicated by Dr. Houk, that certainly that would help minimize the dangers of lead poisoning. What can the Federal Government do?

Dr. **Mahaffey**. Well, I think the WIC program is in fact of particular importance, because it is aimed at women during pregnancy and young children. Now, WIC has had heavy emphasis on iron, low iron status—not necessarily overt deficiency, just low level of iron. Low iron status is both associated with increasing lead absorption, plus there is an increased effect of lead once it is absorbed. So it is sort of a double problem.

In addition to that, iron deficiency by itself has adverse effects on child development, so critical nutrition program would certainly be WIC, both keeping that program going, plus expanding it.

Senator **Reid**. It would appear, Doctor, that maybe the suggestion that Dr. Needleman made—that is, it is $12 to do a test, and I bet that if we did a lot more of them it would even be cheaper—maybe tests like that would be of assistance.

Dr. **Mahaffey**. Part of the way iron status is evaluated is through measurement of this protoporphyrin in blood. That detects both low iron status and lead exposure. However, at the levels of blood lead associated with neuropsychological deficits erythrocyte protoporphyrin does not change. So we need to screen both for iron status using erythrocyte protoporphyrin and for lead using blood lead analyses.

The other major concern about women during pregnancy is that the amount of dietary calcium needed is very high, particularly in the last month of pregnancy. There is a great deal of transfer of calcium for the developing infant. What we really don't know, and it's one of the reasons for the research that we're now sponsoring, is whether supplementation with substantial levels of calcium during this last trimester of pregnancy will in fact block some of the bone resorption.

Senator **Reid**. What do you think now?

Dr. **Mahaffey**. Well, I think the bone is going to be resorbed, and we really need to study it in order to figure out if you can provide enough calcium in the diet to stop this resorption. The answer is, I don't know.

Senator **Reid**. All right.

Dr. Houk, the information regarding Nevada and the other place I mentioned came from the Environmental Defense Fund. They just did a study that came out earlier this week.

The one question I would like to ask, I guess for all of you, and this may not be in your area of expertise, but how are we going to get all of the lead out of the soil? We say that we need to get it out, but how are we going to do it?

Dr. **Houk**. I think that there are several ways. You don't have to take every last molecule of lead out of the soil. We are concerned about the soil that was deposited, basically, as dust from the smokestacks. As Dr. Bornschein said, the mine tailings and stuff are probably not absorbed very well by children.

There are levels, and it's somewhere between 500 and 1,000 parts per million, as a source—depending on the land use particularly around it—in Dallas, around one smelter, a very effective intervention has been sodding and maintaining the sodding of the grounds around that public housing project, and the only lead that had to be removed was under the swings and in the playgrounds where you couldn't have sodding, but that requires maintenance.

So there are ways of dealing with this problem in handling all the sources. At least, 20 years ago the gasoline people blamed the lead people, the lead people blamed the gasoline people, this people blamed the other people. At least now we're beginning to say that it's all multi-media, and come about doing this.

I would submit that if our counterparts of 100 years ago, in trying to look at the sanitation of this country, the old sanitariums, if they took the same approach that we're taking now and said "We can't deal with it because it's too expensive," then we probably still wouldn't have very sanitary water. I think it's time for people to get together, see what can be done, try things out, and do it.

I'm not against research. We don't know every last thing, but we certainly know enough to make some major impact on the majority of children and fetuses in this country.

Senator **Reid**. Would anyone like to add anything to that?

[No response.]

Senator **Reid**. One question I didn't ask, can you paint over lead paint?

Dr. **Needleman**. You're just postponing the day of reckoning. Sooner or later, that's going to peel.

Dr. **Houk**. The answer is that it's a very bad practice. Again, I would like to emphasize, Mr. Reid, that this is not only a public housing problem. I think that there are a lot of very rich people in this country who are now moving back into the cities, whose children have been permanently damaged as they chose to renovate the home while they lived in it.

Senator **Reid**. Senator Lieberman.

Senator **Lieberman**. First, just a point of clarification.

Do I understand correctly, from what I've read of your words leading up to this, that lead poisoning is cumulative in the system?

In other words, it doesn't wash out over time? Its potency increases in the system?

Dr. NEEDLEMAN. It is picked up and stored in the bones, and some of it is always available.

Senator LIEBERMAN. Dr. Mahaffey, did you want to add something?

Dr. MAHAFFEY. Yes. I think another point is that lead is accumulated in the bones. As part of normal child development, the mineral in the bone is constantly turned over, so that even though lead may be initially deposited in the bone, it will be recirculated throughout the body a number of times. This cumulative store of lead in the bone is especially important, again, during the period of pregnancy, when it can be mobilized. The infant's cord blood, the blood that goes to the infant during development, is 90 percent as high as that of the mother, and this lead is accumulated then in the developing infant's brain and the rest of the tissues.

Senator LIEBERMAN. Let me ask Dr. Johnson a question. I don't want to leave you unbothered over there.

I know that you are involved in ATSDR, and that that section of the Public Health Service of CDC made a report to Congress in 1988. I gather that there has been little or no response to those recommendations. Is that a fair assessment?

Dr. JOHNSON. Response from whom?

Senator LIEBERMAN. From anybody, really.

Dr. JOHNSON. I think that the response from within the Public Health Service agencies and the response from EPA has been quite striking. One of the things that we have done since we submitted the report to Congress was to put together a group across PHS and EPA to look at the status of individual recommendations in our report to Congress. We recently submitted a report to the Assistant Secretary for Health that describes our findings.

Basically, what we found was that there is a substantial amount of impressive work going on across EPA, PHS, etc. There are, however, some gaps. One of the principal gaps that we found in this effort was that we did not find any kind of strategy to prevent this kind of serious threat to children. As a consequence of that, the Assistant Secretary for Health has asked that such a strategy be prepared. As Dr. Houk has indicated, it is under preparation.

I think that our findings will be provided to you by the Department.

Senator LIEBERMAN. I appreciate that.

I gather Congress hasn't responded to the recommendations that you made to us. Is that a fair assessment?

Dr. JOHNSON. I think our report to Congress had an effect in terms of the 1988 legislation to deal with lead in water coolers and the establishment of the excellent CDC program in screening and surveillance. There have been some other responses, but I think that overall my agency has not seen an outpouring of response.

Dr. HOUK. Senator, I believe the funding for Title 3 of the Lead Contamination Act is a direct result of that report.

Dr. NEEDLEMAN. As somebody outside of the Government, I would just like to place that document in its historic significance. I think it ranks with the Surgeon General's report on tobacco.

Twenty years from now it will achieve the justified recognition that it really deserves.

Senator **Lieberman**. From my experience in this field, much briefer than yours, I agree with you. That was really the tone of my question. I think the response—while there has been some, as you point out—hasn't yet been enough, and I hope that we are able to look back at it in that same light.

Let me ask just a couple more quick questions. One is by way of what we can do. I think we have talked about the need to remove paint. Should we now consider a national ban on lead in paint of all kinds, including industrial use paint?

Dr. **Houk**. The problem is not new paint, Mr. Lieberman. The problem is the paint that has already been applied.

It is true that when you were in Connecticut, that unfortunately the Lead-Based Paint Poisoning Prevention Act required all lead manufactured after a certain date, rather than sold after a certain date, because you can still find, particularly in the discount markets, some leaded paint. You can still find people that are inappropriately using industrial paint. One of the largest school districts in this country recently painted all of the furniture in the classrooms for the children with an industrial paint that contained 10 percent lead because it was cheaper.

You can also, unfortunately, in the coastal areas of the country find painters who will add white lead to the paint because that gives a better "paint job."

But we still must continue with getting rid of the paints that we have. There are two things that we have to be very, very careful about. One is the protection of the worker and his family. This has to be done safely. And as Dr. Needleman says, this is a very labor-intensive and important kind of activity to do.

Also importantly, we need to know how to dispose of the lead. It makes no sense to me to remove lead as a hazardous substance, and then allow it to be disposed of as a nonhazardous substance.

The third is that there is a great deal of lead on the outside of buildings, on bridges, particularly in the northeast, and until we know how to remove that safely and dispose of it safely, the appropriate place for that paint is to stay on those bridges. We widely disperse it when we sand- blast.

Senator **Lieberman**. Right. I agree with you, obviously, that the main problem is to get the old paint off that is there, but you don't feel that the lead in industrial paint that is being used now is a substantial contributor to the problem that we've talked about?

Dr. **Houk**. Well, if it is used inappropriately. I think that some discussions need to be made with the industry, both the giving and the receiving part, as to whether there are substitutes that are economically feasible to use. If there are not, then I think very strict regulations of how this paint is to be used are in order, and don't allow a school district, for example, to order umpteen million gallons of paint without someone questioning what they are going to use it for. It obviously is not going to go onto an industrial facility if it is ordered by a school district.

Senator **Lieberman**. Dr. Mahaffey, did you want to say something?

Dr. Mahaffey. If I could respond to this also, one concern about applying lead paint in an industrial situation is that ultimately someone will remove that paint. You have a continuing concern about the well-being of a workforce that is both applying and removing paints. The blood lead concentrations considered acceptable in occupational situations are substantially higher than those we find to be associated with neurobehavioral deficits in children based upon the research that has been conducted in the last decade.

Senator Lieberman. Dr. Needleman, a last question. What do I tell a parent who calls me up and says, "I heard about this hearing you had in Washington. What should I do to protect my child?"

Dr. Needleman. Don't let the child eat dirt or paint. That's a dangerous business. Get a blood test. Do it once a year.

Senator Lieberman. Go to a pediatrician and get a blood test?

Dr. Needleman. Insist that they do a blood test once a year.

Senator Reid. Thank you, Senator Lieberman.

Thank you very much. We appreciate your time and efforts and your interest in this subject.

The next panel of witnesses will consist of Ellen Silbergeld—Dr. Silbergeld is from the Environmental Defense Fund, and she is accompanied by Karen Florini; Stephanie Pollack, Conservation Law Foundation; and Dr. Bruce Fowler, University of Maryland Medical School.

We welcome you here today. We would ask that you comply with the same rules that the rest of the panels have today, that you limit your oral statement to five minutes. Your full statements will be made part of the record.

The first witness we would like to hear from is Ellen Silbergeld. Dr. Silbergeld.

STATEMENT OF DR. ELLEN SILBERGELD, ENVIRONMENTAL DEFENSE FUND, ACCOMPANIED BY KAREN FLORINI

Dr. Silbergeld. Thank you very much, Senator Reid. We are very grateful to be able to appear at this hearing with you, and we recognize and salute your concern on this very important issue.

As you know, on Monday, March 5th, the Environmental Defense Fund released a report entitled "Legacy of Lead: America's Continuing Epidemic of Childhood Lead Poisoning," and I am submitting a copy of this with my testimony. We have already made copies available to all Members of Congress. You have already alluded to this report.

In this document we review, as has been reviewed again by many distinguished colleagues in medicine and science and public health, the scourge of lead poisoning, its nature, and its extent. We recognize, as do you, that lead is not a new problem, nor is recognition of its hazards a new discovery in medicine. Nevertheless, we are still burdened with a disease of epidemic proportions among young children, although not solely among young children, in the United States.

As has been noted earlier, there are two primary reasons for this continuation of an entirely preventable disease.

First, as Dr. Needleman and colleagues note, the clinical findings on the hazards of lead have caused a substantial reevaluation of the need to prevent exposures at lower and lower levels. Thus, while we have taken some effective steps to reduce lead exposures overall, these are modest actions, and may I stress that they can only be termed modest, and none of them have been complete; even the so-called ban on lead in gasoline is incomplete. Last year, 10 percent of the gasoline sold in the United States was leaded gasoline. Lead paint is still manufactured and sold. And might I add to the concerns that were expressed by the prior panel, that the manufacture of leaded products inevitably exposes Americans to residues, wastes, and contact with that product throughout the life cycle. Since lead is an element, it never degrades. Any extraction and commitment of this material into commerce will inevitably result in the buildup of contamination of the planet, as has been documented graphically by Clair Patterson and others, over the past 5,000 years of the exploitation of this mineral.

I would also like to stress that the United States may be particularly at risk and our children may be particularly exposed. That is because in this country we made two disastrous decisions in the 1920s which have impacted forever on the concentrations of lead in the United States and in our children. In 1921 the United States, heavily influenced by the Lead Industries Association, refused to join with a consortium of experts in western Europe, Australia, and New Zealand to ban the further use of lead paint for residential dwellings. So for 55 additional years we continued to apply lead paint in various concentrations to the housing units of our country, and we confront this unresolved problem today.

In 1925, the United States Government—again heavily influenced by the Lead Industries Association—reversed the recommendations of distinguished scientists at Harvard and Yale and others and permitted the uncontrolled introduction of alkyl lead into gasoline, and that similarly has irreversibly contaminated the dusts and soils of this country. You spoke earlier of the very great technological problems confronting us in dealing with that residue.

It may have something to do with why the average blood lead levels in American children are about twice that of their peers in the Federal Republic of Germany and in the Scandinavian countries, and probably significantly higher than those of Japanese children, as well.

We have done nothing final and complete to ban any use of lead in this country in this century. Moreover and even more importantly, we have done virtually nothing about the vast reservoir of lead that you've heard described, resulting from those two major disastrous decisions of the 1920s: that is, the continued use of lead in house paint, and the continued exploitation of lead as an additive for gasoline.

As a result, we can now say that the major sources of lead for our children underlying this epidemic are two-fold: exposures to lead from the continued use of lead in leaded products, and also from the sources of lead from past uses, which now constitute enormous environmental reservoirs of hazard. In this latter category, far and away, the highest and most intense source, as many other witnesses have stated, is lead paint in housing. In our report we have presented for you localized estimates on the extent of lead toxicity in United States children as that disease is currently defined by the emerging consensus of medical opinion.

The data in this report are estimates and not actual measurements, although they agree very remarkably with certain surveys that have been done on a limited basis in certain cities. I will be glad to explain how these estimates were derived. In my testimony I have presented two maps of the percentages of children in various U.S. cities with blood levels above 10 micrograms per deciliter and above 15 micrograms per deciliter, and in the report we have similar data estimates projected for other cities.

Let me conclude by stating what the Environmental Defense Fund recommends we do at this time, because we acknowledge, with you, that there is widespread recognition of this problem. The issue now is how to solve it.

It is an enormous problem. It is an enormously expensive and complicated problem to undertake the remediation of a reservoir as vast as the 42 million housing units in the United States with lead-based paint. Moreover, we have unfinished business to do, and we would rank lead poisoning as the prime, most significant piece of unfinished business before EPA throughout all its regions.

We can couple solutions to both these problems—that is, the unfinished business of ongoing uses and production of lead and its dispersal in the waste stream, and the remediation of the vast environmental reservoir in our housing. In our report we propose an innovative solution whereby the imposition of an excise will accomplish three socially important goals.

Number one, it will provide stable, long-term funding for a lead paint abatement trust fund which will place in the hands of knowledgeable public health officials and local authorities with years of experience—people like Jim Keck from Baltimore, who will testify later—the means they have needed to make a significant impact on this long-standing problem in the cities around this country.

Second, it will provide, outside the tortuous entanglements of the regulatory system—a regulatory system that brought you asbestos bans after 17 years—it will provide a mechanism for encouraging the phase-out of substitutible uses of lead so that you will not have to ask, "Should we ban lead paint? Should we ban lead solder in food cans? Should we ban this, that, and the other thing?" Let's let the market make those choices and find a safe and effective level that is also protective of public health. At the same time it will provide for private industry the kind of incentives they need for safe recycling of lead so that we continue to have those leaded products that we need, such as storage batteries as you alluded to, but so that we can obtain this lead in an environmentally- and occupationally-sound manner.

Let me reemphasize that the secondary lead facilities in this country do not meet existing occupational or environmental health standards. We cannot encourage that industry in its present form.

And finally——

Senator **Reid**. Your time has expired.

Ms. **Silbergeld**. Thank you.

This program will, in fact, encourage the spreading of abatement processes which are safe and effective by providing long-term fund-

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ing which encourages the final abatement and removal of the major source of hazard for children in our country, which we would again emphasize constitutes the single most significant preventable disease of childhood in the United States.

Thank you.

Senator **Reid**. Thank you, Dr. Silbergeld.

Stephanie Pollack.

STATEMENT OF STEPHANIE POLLACK, CONSERVATION LAW FOUNDATION

Ms. **Pollack**. Thank you. My name is Stephanie Pollack, and I am the Director of the Lead Poisoning Project at the Conservation Law Foundation, a nonprofit environmental advocacy group based in Boston. In that capacity, I authored Massachusetts' lead poisoning prevention law, which is by far the most aggressive in the Nation. Massachusetts is the only State that has in place a regulatory program designed to ensure the abatement of homes throughout both the public and private housing stock before children are poisoned.

In addition, Massachusetts now mandates the universal screening of preschool children for lead poisoning. Almost half of the children in the State as a whole, and 80 percent of the children in all of the major cities are tested for lead on an annual basis in Massachusetts.

I have also worked with other States in New England, with Verdel Bolden and the other fine people at the Connecticut Department of Health Services, and with health officials and community activists in cities and States throughout the country: Chicago, Cleveland, Philadelphia, Baltimore, Milwaukee, New Orleans, all of whom are struggling with the problem of lead paint because the Federal Government has almost entirely abdicated on the issue.

I am particularly pleased to be testifying before this committee because, like many lead poisoned children, the problem of lead poisoning itself has been overlooked and misdiagnosed. Lead paint is usually thought of as a housing problem, but the presence of toxic lead in the home is no more a housing problem than the presence of radon or asbestos, which have always been treated as environmental problems falling within the jurisdiction of health officials, the Environmental Protection Agency, and this subcommittee.

By holding this hearing, the subcommittee is reinforcing the fact that lead poisoning is an environmental health problem. You recognize lead poisoning for what it is, the most widespread environmentally-caused health problem facing America's children. Once properly classified as an environmental problem, the treatment for lead poisoning seems clear: removing lead from children's environments before they can be irreversibly poisoned by it.

But while the diagnosis and prescription seem straightforward, the Federal Government has yet to acknowledge and adopt a preventive approach to lead poisoning. Neither Congress nor any health or environmental agency has set as its goal the elimination of this man-made and completely preventable disease. Instead, the problem has been left to cities and States. It is they who have been made responsible for finding the children using screening pro-

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grams, they who have had to struggle with the question of how to take lead paint out of houses and how to pay for deleading in homes where the private property owners can't afford it. And perhaps most importantly of all, cities and states have been forced to bear the educational costs of trying to remediate lead-poisoned children through very expensive special education classes, they who bear the costs of high school dropout rates and all the other societal problems that recent research is linking more and more closely to lead poisoning.

Now, contrast what is happening in these localities and States which, while not perfect, is at least a meaningful effort focused on prevention, with what the Federal Government has done. We have complicated the already complicated issue of lead, to which we are exposed in a variety of media, by scattering control over lead exposure among at least half a dozen Federal agencies. The Centers for Disease Control is in charge of State and local efforts to screen for lead, but was given no money for categorical grants during the 1980s. The Consumer Product Safety Commission administers the ban on certain uses of lead paint, but has never taken any action to ban its manufacture entirely. EPA has the authority to address lead under a host of different statutes, but its ambient air quality standard is more than a decade out of date, it has been incapable of revising the drinking water standard, and it has failed to ban the addition of lead to gasoline.

The Department of Housing and Urban Development has been in charge of the Federal housing-based effort for lead paint since 1971. It is 1990, and there has never been a valid set of regulations put into effect under the 1971 Lead-Based Paint Poisoning Prevention Act.

The other agencies are no better. The Food and Drug Administration is responsible for controlling the level of lead in food. They have relied on voluntary industry agreements.

The Occupational Safety and Health Administration has a decade-old lead standard which doesn't apply at all in the construction industry, which means that abatement workers are covered by no standard at all, even an inadequate one.

The bottom line is that the time has come for Congress to begin the process of laying out a strategic plan for the complete elimination of lead poisoning. Although HUD, the Department of Health and Human Services, and other agencies can provide valuable input, Congress has the ultimate responsibility for creating the framework needed to eradicate this man-made and completely preventable disease.

The primary focus of the plan must be lead paint, although it should address all sources of lead in the environment. The time for prevention is here, and this subcommittee is an appropriate place to begin. Lead poisoning is an environmental problem. Its solution properly lies largely in the hands of health and environmental agencies, for what lead destroys is what Walt Disney once described as the most valuable natural resource of this country: the minds of our children.

Thank you.

Senator **Reid**. I was considering, during your statement, limiting your time to two and a half minutes because you talk twice as fast as anybody else. [Laughter.]

Dr. Fowler.

STATEMENT OF DR. BRUCE FOWLER, Ph.D, UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE

Dr. **Fowler**. I am Dr. Bruce Fowler. I am Director of the University of Maryland Toxicology Program, and for most of my research career I have been engaged in trying to develop more sensitive tests for assessing biochemical effects of lead and other metals in both laboratory animals and man.

During recent years there has been growing concern with the effects of low-dose lead exposure on specific sensitive subgroups in the U.S. population. Young children, pregnant women, workers, and now senior citizens are examples of groups within the general population which have been identified as being at specific and particular risk. In addition, it has been known for many years that individuals within those particular populations vary in their sensitivity to this agent.

As we begin to understand the mechanisms by which lead affects biological organisms, we are beginning to raise the possibility of beginning to narrow in on and identify individual risks.

I would also point out that the effects of lead on target organ systems, such as the nervous system and the blood-forming organs, have been known for many years. More recently there are data which indicate that the kidney, cardiovascular system, and the bone itself may be target organs for this agent.

Now, in order to rigorously evaluate these effects, there is a pressing need for research to try to understand both the mechanisms of lead effects in these organs and to try to use that knowledge to develop more sensitive kinds of tests. Fortunately, there are a number of new or refined analytical methodologies that are under development for resolving these issues, and I will touch on these just briefly for you.

The first, which I think most of us believe will be of great value in terms of assessing lead dosimetry, has to do with the use of x-ray fluorescence technology for measuring lead in bone. As has been described earlier this morning, most of us store about 95 percent of our total body burdens of lead within the skeleton, and it stays there for decades. This means that if we could measure this major pool, we could have some idea of what an individual's actual lifetime exposure has been. The practical significance of this, as has been noted by Dr. Mahaffey, for example, is that during pregnancy there is mobilization of minerals from the skeleton, and in fact lead is one of these elements that is mobilized.

More importantly—and I think this is something to be thought about as the U.S. population ages—during osteoporosis, or in the normal demineralization of the skeleton with aging, we may indeed have senior citizen populations who are going to receive their lifetime exposure of lead coming back to them a second time.

These are important questions and I think this methodology, which is now in late stages of development, will permit decisions to be made based on this kind of measurement.

Dr. Mahaffey also mentioned the FEP test, which has been the standard test for measuring biologically-available pools of lead, due to its effects on hematopoeisis. There are improvements in analytical methodologies for measuring disturbances in the hemebiosynthetic pathway system that we think will take us down into some somewhat lower ranges of lead exposure, not as low as we're going to need to go, but certainly helpful.

In addition, the results of research over the last eight years or so have indicated that in experimental animals there are a number of lead-binding proteins which apparently act as receptors for lead and actually may determine an individual's susceptibility to this substance. These are target organ-specific molecules which cause lead to move across membranes and into compartments of cells, where it may then exert effects at low dose levels.

Penultimately, I am also going to note that nutritional factors, which Dr. Mahaffey and Dr. Houk alluded to, are extremely important, we believe, in terms of defining individual risks within these specific populations. Anything that the Congress can do to try to bolster programs for getting good nutrition, particularly to the disadvantaged, I think would help immensely in reducing lead absorption.

Finally, I am going to just indicate that in anticipation of some of these problems, the National Academy of Sciences and the National Research Council have been commissioned by the Agency for Toxic Substances and Disease Registry to form a committee entitled Measuring Lead in Critical Populations which will be coming out with a report in September of this year that will address a number of the currently available methodologies for assessing not only current exposure, but also for tracking any achievements that we may make in terms of lead abatement.

I think I will stop there.

Senator **Reid**. Dr. Fowler, now what is your best judgment as to how we can measure lead levels in children? What's the best method?

Dr. **Fowler**. I would say, based on some recent reports by Dr. John Rosen from New York City, that the x-ray fluorescence technology offers some important advantages over just doing blood leads. One of the reasons is that blood leads tend to be a measure of relatively recent exposure. If you had a child, for example, who was exposed to a high dose of lead early on in their life and the blood lead declined, only to come back to them at another stage, you would miss that just by measuring the blood lead, whereas if you could measure the lead stores in the bone directly, you can then say that this person had elevated exposure.

Senator **Reid**. What is the comparative cost of the two tests?

Dr. **Fowler**. Well, it is hard to compare right now. There are only about four or five of the x-ray fluorescence instruments in the United States that I'm aware of.

Senator **Reid**. Are they expensive?

Dr. **Fowler**. About $55,000 to $120,000 each. That is the expected price of a commercial model.

Senator REID. Which really isn't expensive?

Dr. FOWLER. No.

Senator REID. Compared to a CAT Scan at $1 million.

Dr. FOWLER. This technology is available. My expectation is that as more of these instruments come on line and as more of the basic data in terms of validating them becomes available, the cost of the test would be very similar to what we are paying now for blood leads.

Senator REID. Ms. Pollack, your statement was not only interesting, but I think you brought out some points that give us some hope. If in fact the situation in Massachusetts is as you have indicated, certainly that could serve as a model for what we need to do on a national level. Would you agree?

Ms. POLLACK. I would certainly hope so. I think the most important lesson to be learned from Massachusetts is that we simply decided to go ahead, not wait until every single foreseeable problem was solved, which is what the Department of Housing and Urban Development seems to hope for. Massachusetts put together a rational program that thought through the issues of screening and how to train workers and how to protect safety and how to relocate kids, and then just started. And when we started, everyone said, "There won't be enough workers. There won't be enough lab capacity to do the blood lead tests. There won't be this and there won't be that." And as each deadline passed, the necessary prerequisities appeared. It hasn't been easy; it hasn't been inexpensive; it hasn't been uncontroversial. But as I think is probably true for almost every major environmental initiative undertaken in this country, it is always easier to do than the people who don't want to do a project in advance.

Senator REID. How do we compare with the rest of the world in blood lead levels, do you know?

Ms. POLLACK. Well, Dr. Silbergeld made the point before that at least for certain countries, we are well above them. The primary reason is that the rest of the world banned lead paint 50 or 60 years before we did.

Senator REID. Dr. Silbergeld, tell me something about the geographical distribution in this country. Is there any one place that is especially bad, or are they all fairly bad?

Dr. SILBERGELD. Well, the overall picture, I think, is very devastating. If you look at the first two tables in the EDF report, where we provide general data for the entire country and we break this down in terms of the size of cities, greater or smaller than 1 million, and we look at it in terms of different income distributions and in white and black children, the overall figures are quite horrifying. As Dr. Needleman pointed out, the national incidence of lead toxicity is 16 percent.

Senator REID. Because of this hearing, there has been an increase in the interest in lead poisoning. There even have been a couple of spots on TV programs, but generally, lead poisoning isn't something that is in the public eye like cancer, AIDS, even polio, which is a disease that we've gotten a pretty good hold on. Now you and the two panels that appeared before you have stated that it is the worst problem facing the youth of our country. Is that right?

Dr. **Silbergeld**. It is the worst preventable disease facing young children.

That's one reason why we did this report, Senator, of course, and that was to try and show on a local basis the impact of this disease. If you wish, I can explain how these numbers were generated.

Senator **Reid**. My staff has explained that to me. I understand that.

Dr. **Silbergeld**. Fine. But I think what they show quite clearly is that in most U.S. cities, the incidence of lead toxicity defined by most experts—and you heard many of them—as being above the range of 10 to 15 micrograms per deciliter, that the incidence is on the order of 30 to 60 percent of all children under the age of 5.

Senator **Reid**. I have here a news article from a newspaper in the State of North Dakota. It says that "A Washington-based environmental group's report"—that's your group—"that thousands of North Dakota children suffer from paint-related lead poisoning was based on an unscientific formula and unsubstantiated data from a six-year-old Census Bureau report." How would you respond to that initial statement in the newspaper?

Dr. **Silbergeld**. I would respond as follows.

The way in which these data were derived was essentially a three-step process. The original data set, the only national data set that we have in this country, as Dr. Houk mentioned, is in fact the 1976 to 1980 survey that was undertaken by the Public Health Service. Those data have been updated by the Environmental Protection Agency and by the Agency for Toxic Substances and Disease Registry, and brought forward to reflect such measures as the continued phase-down of lead in gasoline and its projected impact upon blood lead levels, distributed throughout the population. In fact those estimations, undertaken by Federal agencies, have been validated with limited survey data, nothing on the order of the national survey. But we do in fact have a fairly good population-based evaluation of the nature and extent of lead exposure in Americans. That's not outdated, and I don't think it is unscientific. It has been examined extremely critically by many people concerned about lead from all positions.

What we did was to add to that an evaluation of the impact of one of the major factors which determines local variation in the incidence of lead toxicity. We all know that one of the major factors which determines the local incidence of this disease is in fact the existence of lead-based paint.

So we took the updated population-based estimates of lead exposure provided by the Public Health Service—not dreamed up by EDF—and applied to that an estimation of the prevalence of lead-based paint on a city-by-city basis, and that is the source of these numbers.

Now, we have had corroboration from several screening programs around the country in major U.S. cities that in fact these estimations, which are projections, do in fact agree quite well with limited actual survey data that has been done in the cities of Baltimore, Philadelphia, and Oakland.

Senator **Reid**. Dr. Silbergeld, what uses of lead do you or anyone on the panel deem to be essential?

Dr. **Silbergeld**. The two critical uses of lead in terms of the importance they play in our economy, and also in terms of technological availability of substitutes, are generally agreed to be lead in storage batteries, commonly car batteries and other storage batteries, and also lead as a radiation shield.

Many other uses of lead are readily substitutible, but for the reasons we document in our report, which are primarily economic, it is difficult for these substitutes to gain a foothold in the market. It may not be well known in Congress, but in fact lead enjoys, astoundingly, a depletion allowance. This country, by Federal policy, actually encourages the continued extraction and importation of new lead and its entry into commerce. That is, we discriminate against the recovery and recycling of lead from those critical uses, such as batteries and radiation shielding, and its reuse in an efficient and health-protective manner. Recycled lead cannot compete with new lead because of the economic favors that we grant new lead, and we continue to grant them. This is an extraordinary antihealth policy that we have built into our national economy at the present time.

Moreover, we have persisted in following the disruptive and inefficient model of regulation championed by the Environmental Protection Agency and exemplified in its disgraceful 10-year struggle to come to grips with asbestos, in which we try to look at each use as if it occurred in a vacuum and regulate it use-by-use, none of it completely.

Lead is a paradigm substance in that it accumulates both in the environment and in humans. It doesn't matter to a child's brain cell where that lead came from or when it was deposited in the environment. So attempting to divide and apportion the risk in order to develop needlessly complex regulatory structures will be a failure. If EPA succeeds, as it tries to persuade you it will, perhaps in 10 years, in the year 2000, they will come forward with an advance notice of proposed rulemaking, as they did for asbestos 10 years after EDS's lawsuit, and then perhaps seven years after that proposed notice we might have some regulations that might take 10 years to put into effect. So in the year 2020 you can bring us back again and we can tell you about the continued scourge of lead poisoning affecting more and more millions of children.

We would suggest there is a way to cut through this process, and that is in fact to allow the market to assess the criticality and economic feasibility of various uses of lead, and at the same time provide public health officials with that very critical source of stable funding for abating the past uses of lead.

Senator **Reid**. Could you tell us how you really feel? [Laughter.]

Senator Lieberman.

Senator **Lieberman**. Thank you, Mr. Chairman.

Dr. Silbergeld, I gather that—or do I gather correctly—that the most substantial use of lead today, now that it has been banned in most paint, is in batteries? Is that correct?

Dr. **Silbergeld**. That's correct.

Senator **Lieberman**. Is it also fair to conclude that lead in batteries is not a substantial contributor to the public health problem posed by lead?

Dr. SILBERGELD. That would be a limited view. That would be based upon the notion that———

Senator LIEBERMAN. That would be my first limited view.

Dr. SILBERGELD. Right. That would be based upon the notion of wondering whether children eat batteries. But the comprehensive view, which is what we urge that Congress and EPA take, is to consider the making of a battery from start to finish and to consider the wastage and releases that occur from mining, importation, primary processing, secondary fabrication, uses, ultimate disposal, and handling of that disposal.

Senator, I am sure you must share the concern of many people that it is the lead battery industry that is currently responsible for a very serious challenge to the rights of working women through fetal protection policies. So the side effects, social and otherwise, of the continued use of lead are very profound in our society.

Senator LIEBERMAN. I appreciate that answer.

I thought you suggested in your testimony an answer to the question I asked the previous panel, which is, should we now be banning the use of lead in all paint? Did I hear you correctly that you would prefer to have a market mechanism at work than a ban? In other words, impose the excise fee that EDF has recommended, and let the market work its will?

Dr. SILBERGELD. What we are proposing is, if you will, a regulatory experiment in which we see whether this proposal allows the ingenuity of the private sector to respond and preserve those uses of lead that are important, encourage recycling, and allow substitutions to occur, we think, more efficiently and rapidly.

If, however, after an initial period this doesn't work and particularly hazardous uses of lead continue despite the encouragement of the market, then there may have to be directed regulation.

And Senator Reid, if you ask me what I really think, I think that the continued use of lead solder in food is unconscionable.

Senator LIEBERMAN. Tell me about that, because we haven't talked about that.

You mentioned it also, Ms. Pollack. How does lead get into food?

Dr. SILBERGELD. Lead gets into food in three main ways. The most obvious and easily preventable is through the continued use of lead-based solders in canning. There is also, of course, a contribution from general and environmental contamination and probably also water used in food processing, but the most immediate and obvious and preventable source is the fact that we do not have any regulatory structure in this country which actually oversees and controls the use of lead-based solder in canning.

Senator LIEBERMAN. That's the problem that got us interested in Connecticut. We had been told that the food industry had reduced dramatically the use of lead in cans. Do you think that's true?

Dr. SILBERGELD. Yes, I think it has been reduced dramatically in the same way, as Dr. Needleman pointed out, we have dramatically reduced fatalities from lead poisoning in children. The question is, why is any of it being used?

I would also ask you to inquire of the canning industry to present actual data on the use of lead solders in canning. We have been unable to get that, despite their continued assertions of controlling the problem.

Senator **Lieberman**. But there, too, would you suggest that we rely on the excise fee and the market to discourage the use of lead solder in cans, or should we have a ban there?

Dr. **Silbergeld**. I think for this use, we would encourage Congress to flatly ban this use.

Senator **Lieberman**. Okay.

Dr. Fowler, we have been focused here, I suppose for understandable reasons, on children and the impact on children, but you suggested that lead also may have an effect on seniors as well. I would like to ask you to clarify that because I didn't understand it.

Dr. **Fowler**. Okay. Basically what this refers to is the fact that most of us are storing 90 or 95 percent of the lead in our bodies in our skeletons. It is well known that in aging populations, geriatrics, and under conditions such as osteoporosis, there is a demineralization of the skeleton which occurs. This means that one could imagine—well, more than imagine—there are some preliminary data that would suggest that lead is coming back out of the skeleton at that later stage in life.

The thing to point out is that lead is stored in the skeleton for a very long period of time, and under conditions such as pregnancy, osteoporosis, or even what has been observed in workers in Scandinavia who have retired from their jobs, it is essentially a lowering of the lead in the skeleton stores. It is coming back to them just when they need it the least.

Senator **Lieberman**. So, is it possible that this releasing of accumulated lead in older people may contribute to their reduced mental function?

Dr. **Fowler**. I think that's a very reasonable thing to consider.

Senator **Lieberman**. Is any research work going on on that now?

Dr. **Fowler**. There is some work that is beginning now. The analytical methodologies that I mentioned for workers in Scandinavia have been going on for about 10 years, and in this country for about the past 3 or 4.

Senator **Lieberman**. Ms. Pollack, if you could in one sweep of your hand have Congress and the Federal Government do three things to deal with this problem, what would they be?

Ms. **Pollack**. I would give the Centers for Disease Control the full $24 million that has been authorized for the categorical screening program under the Lead Contamination Control Act, and use that money to leverage the creation of programs throughout this country that not only screen children for lead poisoning, but figure out how to follow up on improving those children's environment. That's number one.

Number two, I would find probably somewhere between $10 million and $20 million to begin a program to evaluate—and, if necessary, develop—new technologies for the safe removal of lead from apartments. We're taking lead out of housing now about the same way we did when Dr. Needleman was Chief Resident in Philadelphia in the late 1950s. The simple economic truth is that if you halve the cost of lead paint removal, you double the number of units you can clean up with a fixed amount of money.

The problem of lead poisoning isn't really that we don't know how to take lead out of housing safely. It's that the only way to take it out that we're sure is safe is also expensive, and we need to get to work right away on reducing that cost.

The third thing that I would do is to try to sit the Congress and the appropriate agencies down, as I said before, and really make them come up with a step-by-step strategic plan, the ultimate goal of which is the elimination of this disease. It's time to stop talking about lowering population blood lead levels and dealing with this use and that use and only public housing and really say that, like smallpox, lead poisoning shouldn't exist on the earth.

Senator **Lieberman**. Thank you.

Senator **Reid**. Thank you, Senator Lieberman.

Thank you very much, each of you, for this most interesting panel. We will submit written questions to you also, if that would be appropriate, and we will expect answers within three weeks.

Senator **Reid**. The next panel consists of Mr. Jeff Fontaine of the Nevada State Health Division; Dr. Bela Matyas, Rhode Island Health Department; and Jim Keck from the city of Baltimore.

We will turn first to Mr. Jeff Fontaine.

STATEMENT OF JEFF FONTAINE, NEVADA STATE HEALTH DIVISION, REPRESENTING THE ASSOCIATION OF STATE DRINKING WATER ADMINISTRATORS

Mr. **Fontaine**. Thank you, Mr. Chairman. In addition to my duties with the Nevada State Health Division, I am also on the Board of Directors of the Association of State Drinking Water Administrators.

On behalf of the Nevada Health Division I appreciate the opportunity to provide testimony this morning regarding Nevada's programs to reduce the risk of exposure of children to lead in drinking water.

The Association has also requested that I present their concerns, and likewise expresses appreciation.

The Nevada Health Division has primary enforcement authority for the public water system supervision program, as authorized under the Federal Safe Drinking Water Act. The Association of State Drinking Water Administrators represents all State drinking water agencies. Forty-three States, including Nevada, are dues-paying members.

The Association of State Drinking Water Administrators and the State of Nevada Health Division believe that existing Federal legislation is adequate to protect the public from health risks associated with lead in drinking water. We are concerned, however, that without additional resources, the States' ability to effectively administer existing legislation to abate lead in drinking water will be severely jeopardized by the cumulative impacts of all the regulations that will be promulgated under the 1986 Federal Safe Drinking Water Act Amendments.

Regarding specific programs in Nevada, in accordance with the Safe Drinking Water Act Amendments, the Health Division required public water systems to issue a one-time public notification regarding the risks and mitigation of lead in drinking water. Public water systems serve 90 percent of all Nevada citizens. Also in accordance with the Safe Drinking Water Act Amendments, the

Nevada Health Division initiated a State-wide prohibition on the future use of lead pipe and lead solder in public water systems. This also includes any plumbing in any residential or nonresidential facility providing water for human consumption that is connected to a public water system.

Finally, as authorized under the 1988 Federal Lead Contamination Control Act, the Nevada Health Division developed and managed a program to assist local educational agencies in testing for and remedying lead contamination in schools. This program was developed and managed without a mandate specifically requiring that schools be tested, and without additional Federal or State resources.

The Nevada Health Division did provide all school districts and day care facility operators with the EPA list of water coolers that are not lead-free and information on testing protocol availability and costs. To date Washoe County, the State's second largest school district, has collected 285 samples in 11 schools. Samples collected from 16 fountains in those 11 schools had lead levels in excess of the EPA-recommended level of 20 parts per billion.

These samples were collected in the early morning to capture the worst case condition of water standing overnight in pipes. Follow-up samples collected from the same locations after running the water for 30 seconds showed lead levels far below the EPA-recommended level.

The school district has verified that those lead levels were associated with interior plumbing. Mitigation included replacing limited portions of plumbing. All work has been performed by school district personnel.

The school district has also urged students to allow water to run for 30 seconds before taking a drink.

The Washoe County School District plans to test all water fountains in its 64 schools by the end of this June at a cost of $50,000.

Following extensive coverage of the lead contamination problems in Washoe County schools by the local news media, rural districts began testing their schools. Preliminary results at this point do not indicate a widespread problem in rural Nevada schools. The Clark County School District, the State's largest school district, has not yet initiated a plan to test all of its schools.

Studies conducted by Westpac Utilities, the water purveyor that serves the majority of Washoe County, indicate that their water is moderately corrosive and can contribute to leaching of lead from interior plumbing. Westpac Utilities plans to install treatment costing $714,000 to help reduce the corrosion potential of its drinking water.

This November, EPA plans to promulgate final regulations to assure that water delivered to schools, and homes does not cause leaching of lead from plumbing systems or does not contain high levels of lead. This is going to be a difficult regulation since water purveyors are not responsible for interior plumbing in households. This rule was originally proposed in August of 1988 and received numerous public comments. The Association of State Drinking Water Administrators is urging EPA to re-propose the rule to allow States and others to provide public comment. This will help to ensure that the final lead rule can be implemented.

Regarding the concern that implementation of existing legislation might be jeopardized without additional resources, the ASDWA survey of 35 State drinking water agencies published in July of 1989 reveals that implementation of the 1986 amendments will cost States an estimated $180 million, for initial one-time cost through the year 1992, and lead to an increase in out-year costs of $150 million per year. States will need $47 million for development and $38 million for annual implementation of the lead rule alone. This will be the most costly regulation promulgated under the Safe Drinking Water Act Amendments of 1986.

I thank you for the opportunity to comment.

Senator REID. Dr. Matyas.

STATEMENT OF DR. BELA T. MATYAS, M.D., CHIEF, OFFICE OF ENVIRONMENTAL HEALTH RISK ASSESSMENT, RHODE ISLAND DEPARTMENT OF HEALTH

Dr. MATYAS. Mr. Chairman, my name is Dr. Bela Matyas. I represent the Rhode Island Department of Health, where I am Chief of the Office of Environmental Health Risk Assessment. I would like to thank you and members of the subcommittee for inviting me to testify.

The Rhode Island Department of Health recognizes exposure to lead as being the State's most important environmental health hazard. Parenthetically, I want to note that contrary to earlier testimony, that is not based on problems of lead in water in New England, but rather is based entirely on problems related to lead in household paint, soils, and dusts. I should also add parenthetically that lead should be considered—and I am sure is considered by experts—a major tier environmental health hazard in all regions of the country that have any older urban areas. It's a major problem not only in New England, but on the Atlantic seaboard, in the States of the Great Lakes, in the industrial midwest, as well as the South.

In Rhode Island, in recognition of this hazard, we have established the Childhood Lead Screening Program. This program, working with an extensive referral network of pediatricians, screens children in the State for elevated blood lead levels, focusing particularly on high risk neighborhoods.

In 1989 the program, along with its referral network, effectively screened over 21,000 children, among whom it detected 716 cases with elevated levels of lead (that represents approximately 3 to 3.5 percent). This represents a continuing increase in the numbers of children screened and detected annually, despite the loss of approximately 60 percent of that program's 1981 purchasing power.

However, there are a number of very significant limitations to programs that rely solely on screening and case-finding, which refers to secondary prevention strategies. These types of strategies have a number of limitations, including the fact that a substantial number of children with elevated lead levels will continue to go unscreened and undetected because of the ubiquity of lead and practical resource limitations.

In addition, available screening tests and screening programs are ineffective at reliably detecting blood lead levels that are known to be associated with certain types of irreversible, low-level lead toxicities.

Finally, while a secondary prevention strategy for lead toxicity is an appropriate method for identifying existing cases, it does not prevent cases, because it does not address the actual causes of lead toxicity. Children who have elevated blood lead levels potentially incur significant damage to their central nervous system and other organs in the time before they can be identified by screening and referred for treatment. The sources of lead exposure need to be identified and abated if exposures and re-exposures are to be prevented. Otherwise, children become identified and treated and then returned to the very same environment that caused their initial toxicity.

In summary, a secondary prevention strategy is a very effective mechanism for preventing overt lead poisoning, with such complications as severe encephalopathy and death. However, it cannot prevent the more subtle and insidious effects of lead toxicity that can significantly and permanently impair the health and educational performance of very large numbers of children. Addressing these latter impacts requires a primary prevention strategy that emphasizes risk assessment and risk reduction.

The Rhode Island Department of Health recognizes the need for this critical shift in emphasis, and the Department has proposed legislation to establish a primary prevention program for lead that is modeled largely on its existing asbestos abatement program.

A primary prevention strategy for lead is described in the attachment to my written comments. Briefly, the strategy includes the following components.

The first component is risk assessment, and this includes development of standards and protocols for conducting home inspections for lead; requiring environmental lead risk assessments as part of real estate transfers and for all rental units; and the identification of high risk areas for lead exposure.

The second component is risk reduction, which includes developing training and work practice requirements for lead abatement; licensing certification of inspectors, contractors, consultants, training courses, and laboratories; and providing financial assistance for abatement to low-income property owners.

Finally, the third component involves public education and outreach activities.

In order to effectively adopt and implement primary prevention strategies for lead, there are a number of things which need to be done at the Federal level. A single lead Federal agency needs to be responsible for all aspects of childhhood lead poisoning. The current situation involving multiple agencies with lead-related responsibilities lacks focus and dilutes what are already very rare resources.

In addition, significantly better information is needed regarding many aspects of primary prevention.

Finally, primary prevention for lead is a very expensive proposition. However, resources spent in addressing the prevention of lead toxicity are in general likely to be far more cost-effective than those spent addressing most other environmental health hazards. For example, if the resources currently allotted to the Superfund program were to be used to fund residential lead abatement activities, the net beneficial impact on the health of the U.S. public would undoubtedly be far greater.

The impacts of environmental exposures to lead, particularly the effects on the health of our children, are unquestionably tremendous. These impacts, however, are preventable. The most essential element required to begin tackling this lead problem is the political will to do so.

Thank you.

Senator **Reid**. Mr. Keck.

STATEMENT OF JIM KECK, POLICY DIRECTOR, LEAD POISONING PREVENTION, BALTIMORE CITY HEALTH DEPARTMENT

Mr. **Keck**. Thank you, Mr. Chairman. My name is Jim Keck. I am Policy Director for Lead Poisoning Prevention with the Baltimore City Health Department. I also had the honor to serve as the Chairman of the National Institute of Building Sciences' project committee which developed the guidelines for HUD on the abatement of lead hazards. I appreciate the opportunity to be here today and I thank you for that opportunity.

I have sometimes heard the lead poisoning problem characterized as the "silent epidemic," but as I have made my way around circles in Baltimore I sometimes think "invisible epidemic" might be more appropriate. If the Baltimore City Health Department were to suddenly announce 30,000 cases of measles in the city of Baltimore, the public outcry would be enormous. However, the Health Department has publicly announced that there are 30,000 children in our city under the age of seven who have blood lead levels high enough to be causing permanent brain damage, and there has been hardly a whimper of interest.

I think the reason for this is that people understand the concept of a communicable disease, such as measles with its red spots and its fevers, but people do not understand lead poisoning. Since most lead poisonings are symptomless and never diagnosed, it is quite easy for people to think that it's someone else's problem. However, as we have heard so eloquently here today, it is not someone else's problem. It is really our problem.

Recently I heard President Bush make a statement that he was making education a national priority, and he wanted to see the elimination of illiteracy in America. I think that is a most laudable goal and one toward which we should work diligently. However, it is not going to be possible to eliminate illiteracy in America until we eliminate the problem of lead poisoning because it is lead poisoning that is robbing so many of our children of their ability to learn to read and write.

I think another reason why lead poisoning tends to be invisible is because it is considered a poor kids' problem, and poor kids have so many problems already that adding on one more hardly gets noticed at all. But it's not just a poor kids' problem and it's wrong to think that lead poisoning has boundaries. My office receives dozens of reports of cases of poisonings in middle class children each year. These poisonings most often result from the remodeling or repainting work of private contractors, or even of young, energetic parents remodeling their own older homes. Because of the lack of information and the lack of education regarding the hazards of lead, few contractors and really few people at all understand that the sanding, scraping, and burning of old lead-based paint is extremely hazardous because of the amounts of dust and fumes that are produced.

Recently in the Baltimore area one family realized this hazard in the worst of ways. A young professional couple with four young children hired a painting contractor to repaint their front porch. In the process of preparing the porch for repainting the family noticed that their cat got sick. They took the cat to the vet and the cat was diagnosed with lead poisoning The family quickly had their four children tested, and three of them had unacceptably high levels of lead, one of them quite severe. The work was stopped. The painter was fined by the State of Maryland, but the damage to the children could not be repaired.

This is not an isolated case or a new phenomenon. What is new is that the problem was diagnosed. Even a few short years ago, their poisonings most likely would have gone unrecognized.

So it is heartening that the Federal Government has begun to play a larger role in this problem because much needs to be done, and the Federal Government can help. The Federal Government can assist us through various agencies, such as HUD, in educating remodeling contractors and painting contractors of the hazards--the hazards to themselves, their workers, and their clients. As Ms. Pollack mentioned, we need an OSHA standard for protecting workers. I was recently speaking to a group in one city in the United States and there was a painter in the audience who informed me that his wife had had six miscarriages before they finally diagnosed that it was due to his wife washing his clothes which he was bringing home, burdened with lead dust. That need not happen, and a proper worker protection standard could have prevented that.

The Environmental Protection Agency needs to give us more guidance on hazardous wastes. Currently, the confusion around the waste from lead abatement projects is driving up the cost. In addition to that, it is making insurance companies very, very nervous about insuring lead paint abatement projects.

Federal housing programs for the remodeling of older houses currently do not require the abating of lead hazards. Dealing with lead-based paint during the remodeling or renovation of older homes is the cheapest time to do it, and we should be doing it.

Programs in Baltimore and elsewhere have demonstrated that we can perform lead abatements and we can do them safely. As was mentioned, the Federal Government is now in possession of guidelines which will be released April 1st for effective methods of carrying out this work. While this does give guidance on how to deal with lead paint safely, it does not tell us how to do it cheaply. There are very few jobs that you can do on your own personal home that would cost $7,000 to $10,000 that would not increase the value of your home, and abatement of lead-based paint is one of those things. We need to do something to increase the value of a deleaded home, and I think probably some creative things could be done through Federal mortgage insurance programs that would require notification and the phasing-in of a testing and/or abatement program, because until a deleaded house is worth more than a house that is not deleaded, we are not going to see a lot of voluntary abatements.

I thank you for this opportunity, sir.

Senator Reid. Gentlemen, you have been very good. I think it has added kind of a "home touch" to the problem. We have been philosophical and talking in generalities, and now we're talking about Nevada, Rhode Island, and the city of Baltimore. That's where the problems exist. They really do exist. It isn't just in the textbook, and we've learned that here today.

Mr. Fontaine, Nevada is the fastest-growing State in the Union. We have had reported instances of high levels of lead in children. Water tested in some of the northern Nevada schools indicate they have been above the set levels. What other problems do we have with lead exposure of children in Nevada, a relatively new place as far as people moving in there, not a lot of old homes?

Mr. Fontaine. I'm really not qualified, Senator Reid, to talk about the other risks associated with exposure to lead in soil or air, but——

Senator Reid. Tell us about the water, then.

Mr. Fontaine [continuing]. With respect to drinking water, Nevada is growing. There is a lot of new housing construction.

Senator Reid. Do we still use lead in soldering pipes?

Mr. Fontaine. The Nevada State Legislature passed legislation in 1989 prohibiting the further use of lead solder and lead pipes in both public drinking water systems, and also in household plumbing.

Senator Reid. When did they do that?

Mr. Fontaine. In November, 1989.

Senator Reid. Is lead a groundwater contaminant in Nevada?

Mr. Fontaine. No, it is not.

Senator Reid. Then the testing that you have done, to this extent, indicates that it is coming from the pipes?

Mr. Fontaine. That's correct. The only experience that we have at this point is with the Washoe County schools and the other rural school districts that have conducted extensive testing. As I mentioned in my testimony, the lead appears to be coming from interior plumbing, most probably from the lead solder used to join copper pipe.

In Nevada our concern—if there was lead used in solder or in pipe before the statute banned its use, it would take about five years before most of that lead would be diminished from the soldered joints or pipe.

Senator Reid. Well, there is some controversy as to that, in fact, if the passage of time really does anything.

Isn't that right, Mr. Keck?

Mr. Keck. Yes, sir. And I would like to comment further on this. We were talking earlier about what should be banned as far as lead is concerned and what shouldn't be, and lead in solder, to me, should be absolutely banned rather than just banned in the use of drinking water.

Recently in the Baltimore City Health Department building I saw a plumber working on the pipes in there and I went over and asked to see his solder. He was using leaded solder because it is readily available and plumbers love to use it, because it works better.

Senator REID. It's very easy to work with, isn't it?

Mr. KECK. Absolutely. It's much easier to work with than other solders. It is a very difficult thing to control.

Senator REID. Mr. Fontaine, the school district in which you have done most of the testing is the second largest in the State, is that right?

Mr. FONTAINE. That's correct.

Senator REID. The largest is Clark County School District, which I think is 17th or 18th largest in the country. They have done nothing to this point?

Mr. FONTAINE. They have conducted spot inspections of some schools. Based upon that investigation they have concluded that they do not have a problem in Clark County.

Senator REID. Do you agree with their spot testing?

Mr. FONTAINE. I personally would like to see some additional testing. I'm not sure that it's necessary that Clark County conduct tests of every water fountain in every school, but I would like to see some additional testing.

Senator REID. Dr. Matyas, in Rhode Island, geographically a small State, do you have an estimate as to how much money it would cost to remove the lead there which you think is a concern?

Dr. MATYAS. Rhode Island is actually just a big city that calls itself a State. [Laughter.]

To be very honest with you, that depends so much on factors outside of our control that it is difficult to answer. To truly abate the lead problems in homes involves not only removing the leaded paint in the home, but also dealing with the soil around the home. How much that costs depends on such factors as whether or not EPA decides to identify it as hazardous waste or solid waste.

It could easily cost billions of dollars to cover a State as small as Rhode Island. On the other hand, it could cost even more than that if, as I say, that soil is listed as hazardous waste, and then further requirements are placed on us that make it even more difficult to abate any given home, etc.

Senator REID. Mr. Keck, you gave a graphic example of three children and a cat that got sick with the remodeling of a home. In fact, I think you said they were just doing the porch. Those three children that were tested to have high levels of lead poisoning, there isn't much that can be done to help them, is there?

Mr. KECK. No, sir. When a child is lead poisoned, the damage is done and there is no way of undoing that damage. The only thing you can do is try to prevent further damage by either removing the child from the source of contamination or removing the contamination itself, i.e., abating the property.

Senator REID. Senator Lieberman.

Senator LIEBERMAN. Thank you, Mr. Chairman. Again, I think this has been another excellent panel.

Mr. Keck, I really want to thank you for that statement which you made, which I thought was illuminating and provocative, about the existence of 30,000 cases of lead-poisoned kids. If there were

30,000 kids in any community who had measles or anything else, there would be an uproar.

I think you are probably right, that the difference is that this is not, in that sense, a communicable disease, and its effect is not as easily visible, if I can put it that way. There is a certain terrible subtlety to the impact of this poisoning, on children, particularly.

I would like to ask the three of you if you could each indicate to us the nature of your relations with the Federal Government in the local programs that you've been involved in. Has the Federal Government been helpful? At worst, has it been an obstacle of any kind? Or has it not been a factor at all in what you've done?

Mr. Keck, why don't you start?

Mr. KECK. Well, one of the things that I have noticed of late in terms of the lead program is the degree of intercooperation between the various agencies. When you attend a meeting with HUD, representatives of EPA and CDC and NIOSH are there. When you attend a meeting at CDC, they are all there also.

I think that is healthy because I think that we have too few resources to squander those resources by us each going our separate ways without knowing what the other is doing.

I think that the one thing for which there has been a crying need for a very long time is a set of national guidelines or procedures for dealing with lead-based paint, and it is unfortunate that it has taken so long to develop those procedures. But they are vitally necessary, and I think that the Federal Government has played a tremendously valuable role to communities all over the country who are in a state of chaos—I mean, people are beginning to become afraid of lead, and they are beginning to panic and beginning to take steps to remove the lead from their environment. Many of them don't know how to do it so they are doing it the best way that they can, by the seat of their pants. They are performing many, many dangerous procedures, dangerous to the workers and dangerous to the living environment that people are going to be in once the abatement is finished.

So I think that is a valuable role that the Government has played and thankfully, by April 1st we will have those guidelines.

Senator LIEBERMAN. How about you, Dr. Matyas?

Dr. MATYAS. I think that both agencies and individuals within the respective Federal agencies have been extremely cooperative. That cooperation has been very sincere, but in practice the net results of our interactions have not been particularly helpful in the long run in the sense that Federal funding for our secondary treatment strategy has been decreased substantially. We have waited for years and still have not received from EPA any kind of information that is definitive with regard to what constitutes a safe level of lead in soil. These are the kinds of things that we cannot do at a State level for which we require Federal assistance.

While individuals have been attempting to be very cooperative and very helpful, the products that we need simply have not appeared in any kind of a timely fashion.

Senator LIEBERMAN. Mr. Fontaine.

Mr. FONTAINE. As the State drinking water agency, we have had a very cooperative and I would say productive relationship with

EPA, specifically with respect to the Lead Contamination Control Act, the lead ban, and the lead notification.

I believe the States still need to be involved in the regulation development for the upcoming lead role by EPA. Once that is in place and it is a rule that we feel can be implemented, I think we will have continued good relationships with EPA.

Senator **Lieberman**. Let me just go down the panel again quickly and ask each of you how, in the absence of substantial Federal funding, you have managed to fund your programs.

Mr. Keck, do you want to start again?

Mr. **Keck**. Yes. The State of Maryland has a program which will essentially loan funds for abatement to low income property owners, either homeowners or landlords who rent to low income tenants. If they continue to occupy the property with low income persons, 20 percent of the principal and interest of that loan is forgiven each year for five years, so it essentially becomes a grant.

Senator **Lieberman**. This is a State-funded program?

Mr. **Keck**. That's right.

Senator **Lieberman**. Created by the State Legislature?

Mr. **Keck**. That's correct.

The State also has some low interest loan programs that are providing funds to property owners for abatement, but unfortunately the funding programs cover only a small portion of the total number of abatements that are taking place. It falls upon the private property owner to come up with the funds to do the majority of it.

Senator **Lieberman**. Dr. Matyas, how about your funding?

Dr. **Matyas**. The Childhood Lead Program, the screening program, is State-funded. A large part of the success of the program has to do with the efforts on the part of the State's pediatricians in working with the Health Department. We've had very good cooperation with the State's pediatricians in doing actual screening. Abatement, by contrast, is solely up to the property owners to fund at this point.

Senator **Lieberman**. No support for that?

Dr. **Matyas**. No, we have no money for that.

Senator **Lieberman**. Mr. Fontaine?

Mr. **Fontaine**. The cost to industry, for instance, to replace lead solder with a substitute, has been minimal. The cost for testing in schools and individual homes has really been passed on to consumers and school districts. The administrative costs incurred by the Health Division have really been covered by taking resources from other areas and implementing the programs.

Senator **Lieberman**. Was this done by your own initiative in your department, or was it a State legislated mandate?

Mr. **Fontaine**. It was done within the department.

Senator **Lieberman**. Thank you.

Thank you all.

Senator **Reid**. One last question. As local officials, what do each of you feel is your State's greatest problem with lead, and what do you think the Federal Government should do to assist you?

Mr. Fontaine.

Mr. **Fontaine**. Additional appropriations for implementation of existing regulations.

Senator **Reid**. It's a question of money?

Mr. **Fontaine**. Yes.

Senator **Reid**. And more direction?

Mr. **Fontaine**. Yes.

Dr. **Matyas**. It would be the same, money and direction.

Mr. **Keck**. I would agree with that, and I would add some additional assistance, as was pointed out earlier, in finding new methodologies for dealing with lead-based paint that are equally safe but more cost-effective.

Senator **Reid**. Gentlemen, thank you very much. Your testimony has been most interesting. We will submit some written questions to you so that the record will be complete.

The final panel today will consist of Jeff Zelms, President of the Doe Run Company, on behalf of the Lead Industries Association; Dr. Jerry Cole, International Lead Zinc Research Organization; Mr. Robert Muth, ASARCO, Inc.; and J. William Horton, President, Battery Council International.

You have been here during the hearing most of the morning. We appreciate your patience. What we would ask is that you limit your remarks to five minutes. We will have questions for you.

The first testimony this morning will be rendered by Jeff Zelms. Mr. Zelms.

STATEMENT OF JEFFREY L. ZELMS, PRESIDENT, THE DOE RUN CO., ON BEHALF OF THE LEAD INDUSTRIES ASSOCIATION

Mr. **Zelms**. Mr. Chairman, my name is Jeffrey L. Zelms. I am President of the Doe Run Company, a major producer of lead and other metals. I also function as Chairman of the Lead Industries Association, a trade association whose members are producers and consumers of lead.

I welcome the opportunity to contribute to the discussion, and I hope the solution, of the problem caused by flaking and peeling lead paint in poorly-maintained older houses.

The use of lead in interior house paint was discontinued nearly 35 years ago, partly as a result of the Lead Industries Association's efforts. That was initiated then on a voluntary basis. The written testimony describes steps taken by the Lead Industries Association to support and encourage research on lead health issues, to support the development of community lead screening programs, and to educate parents on the availability of such programs.

We have worked to enhance public awareness of health problems that are caused by deteriorating leaded paint and to encourage Congress to take action to solve those problems. Most recently we participated with the National Institute of Building Services in a research project for the Department of Housing and Urban Development designed to produce guidelines for treating and removing lead-based paint in houses. Those guidelines, as you have heard, will be released later this month, and we should know more then about the dimensions of the problem and the means to solve them.

We think it important to recognize that, unlike leaded paint and other products that involve significant public exposure to lead, the lead products of today involve very little exposure. Three factors explain this. One is that products involving public exposure have been discontinued or greatly reduced. These include lead paint, lead gasoline, lead drinking water service pipes, and lead solder in food cans.

Secondly, 60 percent of the lead produced in the United States today is recycled.

Third, lead production and use are subject to comprehensive Federal regulations.

I want to point out that the lead we produce today is used in products, such as the lead acid storage battery, that are essential to our economy. There is no satisfactory substitute. Mr. Muth's testimony will cover the points concerning Federal regulation of lead and will show that the public's exposure to lead has been significantly reduced, with a resulting sharp decline in blood lead levels throughout the Nation.

I want to mention briefly today's lead products, many of which are illustrated in the booklet attached to my written testimony, and I would encourage your perusal.

Today, 78 percent of the lead that is produced in the United States is used in batteries, and they have a high recycle rate. In addition, because of the special properties of lead, its density, malleability, and resistance to corrosion, uses for the metal have been found in high technology and other products that play an important role in the U.S. economy. These new uses all involve little public exposure to lead, and some provide important health benefits. They include radiation shielding in the face plates of television sets, computer screens, and other video display terminals; computer electronics and components; staple memory chips, that are a major technological breakthrough because of their ability to retain data even when the power is shut off; sound attenuation; and the sheathing used on underground cables.

New uses for lead involving important public benefits are on the horizon. They include General Motors' experimental battery-powered automobile that could greatly reduce fossil fuel emissions; giant lead-acid load-levelling batteries which can provide standby power during periods of peak demand and eliminate the need to keep generators operating on so-called "spinning reserve;" sheet lead barrier systems designed to reduce the hazards posed by radon; and the use of lead in building foundations to absorb earthquake shock.

In conclusion, we support governmental efforts to address deteriorating paint in older houses. We also believe it important that Congress recognize that lead plays a valuable role in the U.S. economy, and that many new uses of lead will provide economic and environmental benefit. Congress should understand that public exposure to lead from today's lead products does not pose a significant health risk.

Thank you.

Senator **Reid**. Thank you very much.

We would like to hear now from Dr. Jerry Cole.

STATEMENT OF JEROME F. COLE, PRESIDENT, INTERNATIONAL LEAD ZINC RESEARCH ORGANIZATION, INC. ACCOMPANIED BY ROSALIND VOLPE

Mr. COLE. Thank you, Mr. Chairman. I am Jerome F. Cole, and I am President of the International Lead Zinc Research Organization, perhaps better known by some as ILZRO. For over two decades our organization, which is supported by the international lead and zinc industry, has been supporting a comprehensive program of research on the environmental and health impacts of the production and use of lead.

With me is Dr. Rosalind Volpe, also of our organization, who assisted in preparation of the tables that are included with my statement.

Today I would like to address one key issue: how strong is the evidence that low blood lead levels pose a significant threat to health?

The evidence that is used to support that allegation are the prospective epidemiologic studies of children, which are summarized in Tables 1, 2, and 3 of my statement, which has been submitted. What is absolutely clear from these tables is that there is a lack of consistency in the results of those studies, all of which are similar in design.

Some of those studies show effects at certain times; others show different effects at other times; some show no effects at all. The effects seen in the Cincinnati study, for example, are largely attributable to low birth weight in the higher blood lead level population. Other studies show no effect on birth weight at all.

Some of the deficiencies which are noted earlier in life, perhaps only a couple of months after birth, disappear later on. The short of it is that there is a great deal of inconsistency across all of the studies.

Now, what the studies are saying is that if there is an effect of low level lead exposure on neurobehavioral performance and intelligence—and that's not at all clear—that effect is extremely weak. To contend otherwise would require one to disregard the inconsistencies, disregard the studies showing no effects, and consider any measured effect, no matter what it is and when it occurs or how inconsistent it is, as an adverse lead effect.

Besides that, blood leads in this country are low and are falling. No one knows the actual distribution of blood lead levels in the United States because the last comprehensive study was carried out 10 to 14 years ago. However, EPA has estimated that the average blood lead level today in the general population is on the order of 4 to 5 micrograms per deciliter. In tables that we attached to our statement we have shown a steady decline in population blood lead levels over the past 50 years, and we also show the results of other studies in which blood lead levels were taken at different points in time. These also show a steady decline in blood leads. This decline is due to a long series of controls, some voluntary and some regulatory, that have been in place for many, many years.

In my prepared text I commented on the paper by Dr. Herbert Needleman. The reason for that is that it was cited as one of the reasons for holding this hearing. Dr. Needleman's recent study was a follow-up on a study that he carried out in the 1970s that was published in 1979. That study, as I have indicated, was heavily criticized by an EPA-appointed expert committee on pediatric neurobehavioral evaluations. That committee uncovered some errors and some deficiencies in the original work and resulted in a reanalysis by Dr. Needleman, which he subsequently published. I think it would have been more informative if EPA had sought the view of the expert committee on the adequacy of that reanalysis, but they did not.

One of the main criticisms of the 1979 study was its lack of adequate covariant control. That deficiency still exists in the follow-up study. The only thing that the new study clearly shows is that IQ at an earlier age is a good predictor of later performance. Of course, that is well known. But the question of whether or not the original IQ deficiencies were caused by lead has not been answered by either study.

It is time that another expert committee be assembled to evaluate and try to make sense of the current prospective studies. Each of the current investigators undoubtedly believes in his or her own approach and analysis, but we need an objective evaluation by experts—not lead experts, not regulators, not industry, not environmental activists, but by independent scientists who are expert in the field of psychiatry, learning disability, neurology, and statistics. Such an evaluation must be done before we can assess the need for bans or even more stringent regulations than exist today. None of this, however, should stop Congress from taking the necessary and effective steps to eliminate the acknowledged problem of old lead-based paint in deteriorating housing.

Thank you.

Senator REID. Could we hear from you now, Mr. Muth?

STATEMENT OF ROBERT J. MUTH, VICE PRESIDENT FOR GOVERNMENT AND PUBLIC AFFAIRS, ASARCO, INC.

Mr. MUTH. Thank you, Mr. Chairman. My name is Bob Muth. I am Vice President of ASARCO, Incorporated, which is a mining company and one of two U.S. producers of primary lead metal. I might say that we're trying very hard to become a producer of primary gold in Nevada, but so far we haven't struck it rich in that line.

Senator REID. You're one of the few that hasn't. [Laughter.]

Mr. MUTH. Well, it sometimes seems that way, but believe me, there are lots of us fellows out there still trying.

We also operate overseas through associated companies. Among the things we do is mine, smelt, and refine lead in a number of countries around the world.

With your permission, Mr. Chairman, I will submit my prepared statement for the record and use the few minutes available to me to speak directly to the subject of most direct interest to this committee, that is to say, children at risk from deteriorating lead paint. I will also try to focus on those issues on which I think we can all agree rather than on those questions that still tend to divide some of us.

First, Mr. Chairman, we recognize the problem. Today, deteriorating lead pigmented paint—some of it applied a century ago—is associated with potentially hazardous exposures for some people, and especially for children.

Second, we agree that there are things that can and should be done that can reduce the exposure of people at risk, and that there is no reason for us to wait.

Specifically, we believe increased governmental and private sector efforts in four key areas would yield significant positive results.

First, funding for community blood lead screening programs. You heard a lot about that today. These programs are essential to any properly-directed effort. In recent years they have been underfunded, and we wholly and heartily endorse the Congressional authorization of $22 million—I heard the figure $24 million—either $22 million or $24 million to the Centers for Disease Control for grants to municipalities.

Second, we need better technologies to detect the presence and concentrations of lead in paint, and we need laboratory procedures—better procedures, standardized procedures—to analyze paint. Here I think the industry can be of particular help. I am told, for example, that there are simple wet chemistry tests available today that can be used as preliminary screening mechanisms.

Third, we agree that we need more and better education and public awareness programs, both for health professionals and for the general public.

And finally, and very importantly, we need to improve and settle upon abatement and prevention techniques that will most efficiently reduce lead exposure of individuals living in households with deteriorated lead-pigmented paint. Here we must take heed of Dr. Bornschein's story of the frustrated efforts at abatement in Cincinnati, where many dollars and much hard work may largely have been spent in vain.

My company is prepared to support well-designed legislative initiatives to help ensure that the actions I am discussing take place. We are also committed to working with others to pursue through nonlegislative means activities that help reduce exposures from deteriorated paint.

Now, it is clear enough that all of this takes money. The sources, amount, and uses of those funds need to be given careful consideration, and we will be developing our own proposal.

In this respect, Mr. Chairman, I would like to mention our appreciation for your kind reference to the funds that the industry has to date poured into environmental projects in and around our production facilities.

It is perhaps unnecessary, but I think I must note for the record that proposals such as that of EDF, that frankly seem more likely to impair the industry than to raise the necessary funds, are not the sort of thing we have in mind, nor do I think they will do the job that you want to do.

Two final thoughts, sir. While we may not accept all of Dr. Needleman's thoughts to the extent that he would like, I think we can agree on some very important things, and enough to get us moving in the right direction. For example, I think Dr. Needleman has made his view quite clear, that harmful exposure to lead—even by his own conservative standards—can become like smallpox, a thing of the past, if problems associated with deteriorated lead pigmented paint can be effectively addressed and if water supplies are properly treated to avoid leaching of metal from plumbing systems. We are prepared to work in both of those areas.

I see my time is up. I will stop.

Senator REID. Mr. Horton.

STATEMENT OF J. WILLIAM HORTON, VICE PRESIDENT, JOHNSON CONTROLS, INC., AND GENERAL MANAGER, JOHNSON CONTROLS BATTERY GROUP; PRESIDENT, THE BATTERY COUNCIL INTERNATIONAL

Mr. HORTON. Thank you, Mr. Chairman. I am Bill Horton, Vice President of Johnson Controls, Inc., and General Manager of the Nation's largest automotive battery company. I also serve as President of the Battery Council, International, on whose behalf I appear here today.

As you have heard from other witnesses testifying today, lead batteries account for approximately 78 percent of this Nation's lead use. At least 80 to 90 percent of lead batteries are recycled, thus the majority of lead today ends up being recycled for reuse and not in the municipal waste stream or the ambient environment.

Accordingly, it is our view that lead battery recycling is a significant and important means of avoiding any potential lead exposures.

We are pleased to have the opportunity to discuss with you today the historic success of our industry in recycling batteries and the continuing efforts to promote and sustain very high battery recycling rates. Allow me first, however, to provide some background on the BCI.

We have over 250 members worldwide, each involved in some phase of battery manufacturing, supply, distribution, or recycling. Domestically, our membership accounts for approximately 99 percent of the Nation's lead battery manufacturing capacity and approximately 92 percent of its battery recycling capacity. Our members account for 86 manufacturing plants located throughout the country and battery retailers in every State, such as Exide's automotive sales and service stations in Reno and Las Vegas, Nevada, and Wallingford, Connecticut.

The lead batteries we manufacture and recycle are used for starting, lighting, and ignition systems in automobiles, other vehicles, and marine systems; to power computers and household tools; and in a variety of industrial applications. In 1989, over 87 million lead batteries were sold in the United States. Lead battery usage is growing because of the consumer demand for electrical devices, the fundamental relative efficiency of this power source, and—we believe—the recyclability of our product.

Few people realize that lead batteries and their components are almost completely recyclable, and even without legislative encouragement, they are being recycled. A sophisticated and voluntary battery recycling infrastructure exists today and can be expected to grow. Indeed, major capital expansion programs recently have been announced by several companies that will assure continued recycling capacity into the next century. Nonetheless, some percentage of batteries now escape recycling.

BCI thus has committed its resources to advancing efforts to close this gap. Allow me to cite three specific examples of our efforts.

First, BCI is actively promoting both State and Federal legislation that will encourage the recycling of lead batteries and impose the least cost on consumers, retailers, distributors, and manufacturers. Our experience has shown that if retailers readily take back used batteries and consumers are aware of their take-back opportunities, consumers will voluntarily trade in their used batteries. BCI believes, therefore, that to the extent that legislation is necessary to promote recycling, such legislation should emphasize increasing consumer trade-in opportunities.

With this in mind, BCI has advanced enactment of a model State battery recycling bill that would prohibit the incineration or land disposal of batteries; require retailers to accept used batteries as returns; require point of sale educational signs stating that fact; and require wholesalers and manufacturers to retrieve spent batteries from retailers and take them to secondary smelters for recycling.

Legislation based on BCI's model has been adopted in 13 States to date and is under active consideration in approximately 20 other States. As a practical matter, however, BCI believes Federal legislation to address this issue would be much more appropriate than continued piecemeal adoption of State programs. Battery manufacture and distribution is a classic example of interstate commerce, and lead batteries are produced and distributed on a regional basis and are not manufactured for sale in specific States. When different States impose different requirements, even seemingly innocuous differences such as product labeling obligations, significant and unnecessary costs are imposed on the battery manufacturing industry, and ultimately on consumers. This is a classic interference with interstate commerce, and we believe the Congress should act to eliminate it.

For this reason, BCI has urged the inclusion of a provision analogous to our model State bill in the RCRA reauthorization and pollution prevention bills currently under consideration. We are pleased that such language has been included in these bills, pending both in the Senate under your sponsorship——

Senator REID. Your time has expired.

Mr. HORTON. Okay.

Senator REID. Gentlemen, thank you very much. I have a number of questions.

Mr. Zelms, I have read the article from the magazine Commerce, I think the name of it is. One of the things that concerns me in that article is that you indicate that you are interested in producing new sources for lead, namely, roofing surfaces and asphalt for highway and road construction.

From what we have heard here today, unless you can convince me to the contrary, it seems that the very worst thing to be doing with lead would be putting it on roads where people can drive and stir it up, and on roofing surfaces. Tell me why that would be a good use of lead.

Mr. ZELMS. Well, I think you have to register the fact, Senator, that we have no intentions of promoting products where lead could not be managed in an extremely environmentally safe fashion. The addition of the asphalt additive—and it is an extremely small quantity—is embodied in the asphalt. There have been extensive tests done throughout the United States and Canada, with backgrounds established, and then ongoing tests as to whether or not that lead compound did in fact leach from the asphalt. Our tests to date indicate it does not.

The economic effect there is that the life of asphalt, which is short primarily because of oxidization which takes place due to sun and rain, can be halved, if not better, therefore achieving an increase in the life of our asphalt highways throughout the United States of some two to three times. With the emphasis on a tax for deteriorating highways, we think that can serve a very beneficial purpose but it must be done in an environmentally safe fashion.

Roofing is a very similar story.

Senator REID. We hear about gold and silver prices every day. Please tell me how much lead is. Is it by the ounce, or pound?

Mr. ZELMS. Lead is sold by the pound. It has a posted price——

Senator REID. How much is it today?

Mr. ZELMS. As of this morning, that posted price was something—I can't quote it exactly, but something on the average of $0.45 a pound.

Senator REID. Mr. Cole, your testimony was interesting but troubling to the extent that you don't debate any of the testimony that we've heard here today, which has been produced in large quantities, that lead adversely affects people and especially children. You don't dispute that?

Mr. COLE. No, Senator, I don't dispute that. I question the dosage, however, that is required to cause that harm. I think that's really what the discussion here is about.

We all know that lead at high levels of exposure causes adverse health effects. There has been ample evidence of that in the past. When you get down to the levels that we're talking about now—10, 15, some people have even said as low as 3 micrograms per deciliter—I think the evidence is certainly not clear at all, and that was the purpose of the tables that we presented to you, showing the inconsistence of those results. I don't think the evidence is clear at all that levels of lead at those blood lead levels cause harm.

Senator REID. Weren't those studies upon which you generally relied, though, studies sponsored by the lead industry?

Mr. COLE. Two were, three were not. Two in that document there were studies mentioned by Dr. Mahaffey earlier, sponsored by NIEHS. Two have been sponsored by the lead industry and one was sponsored by the Australian Government.

Senator REID. I have a conviction that we have a problem with lead. It would seem to me that the lead industry would be best served by trying to work something out rather than trying to be like the tobacco companies have done for years, saying that there is not a problem with tobacco. We all know that tobacco causes people to get sick. From the evidence that we've heard here—we have one doctor who has basically devoted his life to the study of lead as it affects children. There are other people. Of course, he is the most prominent and the preeminent person in our society that has done that. But it is generally accepted that lead causes problems, and I think that we shouldn't—again, I repeat—be like the tobacco industry and say that it doesn't cause problems. I think the lead industry would be well served.

That is why, whether I agree with you or not, Mr. Zelms—I appreciate your demeanor and your approach. I think that we need to look at some of these studies regarding asphalt. I think we have to look at roofing surfaces. I have some concern about that.

As you can probably tell from the tenor of these hearings, Senator Lieberman and I and probably Senator Chafee are going to be proposing legislation that is going to affect the lead industry. We want to do something that is fair, but as the evidence here clearly indicates, we're not going to wait around a long time. I agree that we have enough knowledge to know that lead is a problem. There may be some further studies necessary, but I think it would be in the best interest of the lead industry that you cooperate with us.

I would further indicate that I am very interested in storage of electricity. In my last trip west I traveled to the Mojave Desert, to Mojave, California, and looked at the largest solar generating facility in the world, the largest by some 200 percent, the Lewes Company. They are now working on batteries. The same Israeli-based company that developed solar energy as we know it today is now working in Israel on batteries for longer storage, and I think that's something that is going to take place in the future, but it's only going to take place if we can prove a safe way of manufacturing and recycling those.

Mr. **Zelms**. If I may respond, Senator, first, we absolutely want to help. The industry is prepared to help. Speaking specifically for my company, one of the things addressed earlier was an inability for citizens to find diagnostic screening abilities. Our company has extended voluntary lead testing to the dependents of its employees, and most recently we have extended that to the general public in the area of our smelting facilities. I think that's one demonstration.

If you look at the history of what the lead industry has done, perhaps we can argue the degree of responsiveness, but Senator Kennedy of Massachusetts made the comment in a hearing not too long ago that specifically commended the Lead Industries Association for its willingness to participate.

I would reemphasize to you that we want to help. We simply think there needs to be an understanding that the lead products of today can be managed, are being managed, in an environmentally-safe fashion. And if they are not, they should not be produced.

Senator **Reid**. In the battery industry and in the mining industry, are the workers tested for lead?

Mr. **Zelms**. Yes, sir.

Senator **Reid**. Okay.

Senator Lieberman.

Senator **Lieberman**. Thank you, Mr. Chairman. It has been a long morning but a very educational one, and I just would accept what you have said as a premise for what I am about to say.

I spent a fair amount of time getting ready for this hearing and reading over the materials. Respectfully to you, Dr. Cole, I do think you're going to have a hard time convincing people in Congress that there is not a very serious problem among children that is caused by lead poisoning. I don't mean that we're ending rational discussion, but as one Senator's reaction, there is a serious problem out there. You in your way, just as the others who are researchers in this area, said earlier that it is time for action. The question is, what are we going to do to lessen the threat in the future? And what can we do cooperatively to reduce the source of the problem that has been described today, which is really a difficult one to grab hold of, not only the paint chips that we all have in mind that the kids eat, but that seems to be a small part of the problem, really. It's really more the lead dust in the air and the soil.

Let me just ask you very briefly—and this is a dialogue that I am sure will go on, now, in the months ahead in more detail—but Mr. Zelms, I will address it to you. Do you think, either through the excise tax that EDF has proposed or some other means, that the lead industry is willing to help the Government deal, in a sense, with the old problem, the problem of lead-based paint, which is still causing a current problem, which is this disease in children?

Mr. ZELMS. Well, Senator, I don't think there's any question that the lead industry is fully prepared to have meaningful discussions on the subject of how you fund these corrective actions. We do disagree with the mechanism as suggested because there seems to be an implied position there of ending the lead industry in the United States.

The potential problems that exist in terms of definition, of what would receive a tax and what would not and who would be getting incentives—in my particular company we do both primary and secondary lead. The ramifications of it are far reaching, but I think the bottom line is that the industry must be and is willing to sit in meaningful discussions with yourselves and other people to arrive at a mechanism for funding.

I think it is not yet clear what the required level of funding is. Clearly, we can all agree that zero is the wrong answer, but what is the right answer? And until you have the right answer, it is difficult to say what kind of funding mechanism is required. You've heard representatives sit here today from various State and city organizations that apparently have made some rather significant accomplishments without Federal involvement. I would suggest that that should be considered.

If I were in your position, I think I would say, "I am sure zero is wrong. I don't know what the right answer is." And I would want to be offered more than one option.

I would end by saying that we are prepared to sit and discuss this issue and come up with options.

Senator LIEBERMAN. Okay. I appreciate that, and I am sure that will happen.

Thank you.

Senator REID. Senator Lieberman, I want to express to you publicly my appreciation for you and your staff for your help in putting this hearing together, and your personal interest in this and the other subjects of this subcommittee. I publicly commend and applaud you and the people of Connecticut are lucky that you are in the Senate.

I would also like to express my appreciation to staff who helped prepare for this hearing: Sarah Walzer and Mike Glennon in Senator Lieberman's office specifically; Stephanie Clough, with the full committee; Maria Alanza and Steve Roady, also with the committee, and members of my personal staff, Sheila Humke and Chris Bailey.

I excuse the panel and express to the five of you, and everyone who has been here today, that this has been a long hearing. I appreciate everyone's patience. As with a trial—I used to try cases before I came back here—the evidence has been submitted. We are going to come up with a verdict. We are going to do something, and I have to tell you that we're going to do something, even if it's wrong. I think it's time that we did something.

Again, I appreciate everyone's time and attention to this very specific problem, recognizing that some have an academic interest, some have a professional interest, and some have an interest that affects their businesses. All of this will go into what we hope will be some good legislation.

Thank you very much.

[Whereupon, at 1:10 p.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]

[Statements submitted for the record and replies to additional questions follow:]

STATEMENT OF
VICTOR J. KIMM, DEPUTY ASSISTANT ADMINISTRATOR
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT,
RESEARCH AND DEVELOPMENT
OF THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

MARCH 8, 1990

Mr. Chairman and members of the Subcommittee, my name is Victor J. Kimm and I am the Deputy Assistant Administrator for Pesticides and Toxic Substances of EPA. I want to thank you for the opportunity to testify before you today about the EPA's program to control lead in the environment. EPA has long recognized that lead is a significant health and environmental problem--in fact, it is one of the nation's most toxic multi-media contaminants. Lead is of particular importance and concern because of its impact on infants and children.

Lead is a very common metal, with a long history of use in a wide variety of products. We have used it in paints, in gasoline, and in solders which have left us with a legacy of deposits; it is indestructible in the environment. Lead causes a broad range of health and environmental problems: it has multiple routes of entry and affects a wide spectrum of organs and systems. It is toxic to both humans and animals, and produces chronic as well as acute effects depending upon the levels of exposure.

Over the last two decades EPA has taken aggressive actions to reduce risks associated with lead exposures. By the late 1970's we recognized that lead exposure can create permanent damage to intellectual capacity. We knew that lead in gasoline was a major part of the problem, and EPA undertook a massive effort to virtually remove lead from gasoline, resulting in about a 90 percent reduction in emissions in urban areas.

Blood lead levels have dropped dramatically, because of the lead phasedown in gasoline and other important federal actions--such as banning the use of lead in house paint, banning lead solder and lead pipes for drinking water systems, and phasing out solder in cans containing food. However, as blood lead levels have been declining, concerns about lead toxicity have been increasing. New studies show a diverse set of subtle, but significant, health effects not only in children, but in fetuses and in adults as well, at blood lead levels previously considered safe. These additional studies suggest a continuum of health risk down to very low levels, though effects of lead below 10 ug/dl are currently difficult to detect or evaluate.

Our threshold level for lead-engendered neurotoxicity in children has declined steadily over the past decade as we have more, and more sophisticated, studies. EPA's independent science advisors recommended that the Agency should seek to minimize the number or percentage of children with blood lead levels above 10 ug/dl. The Centers for Disease Control has reduced their toxic blood lead level twice over the past 12 years.

The principal pathways of exposure that we find today are: deteriorated lead-based paint, which is present in buildings, in dust and in soils; drinking water supplies, which comes from the distribution and plumbing systems as well as the source water supply; and soil contamination, from previous deposition by gasoline and paint--especially in urban areas. Food and occupational exposures are other important pathways. These exposures are national problems; there are also localized problems. People who live near point sources, especially smelters, have higher-than-average exposures, as do people who live in buildings with deteriorating lead-based paint.

While certain uses of lead have markedly decreased due to government action, the total amount of lead used in the U.S. has not decreased in recent years as might have been expected after the phasedown of lead in gasoline. Increases in the demand for lead acid batteries are the principal reason for the continued size of the lead market, although about 80 to 90 percent of these items are recycled.

Controlling unacceptable risks from lead is technically very difficult and can be extremely expensive, particularly when it involves remedial actions such as cleaning up contaminated soil. Controlling these risks may be complex and expensive since we are dealing with a cross-media problem with potential implications for virtually all of the programs administered by EPA, and a problem for which further regulation must take into consideration the privacy of people's homes.

The wide variety of activities conducted by EPA illustrates the Agency's recognition of the scope and seriousness of the problem. Let me provide a brief summary of activities across our various programs. The principal areas of current activity include: reviewing/revising our ambient and new source performance air standards; promulgating standards and delivering training programs for drinking water; working with HUD on the abatement of exposures from lead in paint in old buildings; pursuing an ongoing research program, including studies to evaluate soil exposures and "low tech" management procedures; and controlling lead discharges to surface waters.

We know that there is much more to do. EPA's Deputy Administrator has committed the Agency to addressing the lead problem in a more aggressive way, and has made it a high priority for all program offices. He has instructed Agency officials to focus on lead exposures and risks, media by media, and to identify risks which are not adequately handled by existing standards. EPA programs are also coordinating to make sure that their actions are based on a common understanding of the risks.

In addition to reviewing individual rules and initiatives under the various statutes, the Deputy Administrator has instructed the program offices to consider the problem collectively and develop a coordinated multi-media control strategy. Agency offices are assessing what additional steps we might take, and developing a comprehensive, Agency-wide strategy for lead to address residual health and environmental risks from lead, including potential pollution prevention measures designed to reduce the amount of new lead being introduced into the society.

Let me outline briefly what the Agency has already done to eliminate risks posed by lead. EPA has been regulating lead for almost two decades. Perhaps our single largest achievement on lead to date was the phasedown of lead used as an additive in gasoline.

Lead in Gasoline

In 1973, EPA's Office of Mobile Sources, within the Office of Air and Radiation, initiated an incremental reduction of lead in gasoline. In a series of phases, the total lead usage in gasoline has been reduced to less than 1% of the amount used in 1970--the peak year. We have seen parallel decreases in both air lead and blood lead levels. In 1982, leaded gasoline contained 1.25 gram/gallon and accounted for 86% of the lead in the atmosphere. Following lengthy public debate, EPA issued new rules to further restrict lead as an additive. By January 1986, the allowable amount of lead in gasoline decreased to 0.1 gram/gallon. Overall ambient lead concentrations have dropped dramatically. Between 1975 and 1984, ambient air lead concentrations dropped by about 75%. After the last reductions in leaded gas, air concentration levels dropped further, a total drop of about 90% in cities without major point sources between 1975 and 1990. Air lead levels in U.S. cities today average approximately 0.1 - 0.3 ug/m^3 (quarterly average). We estimate that average blood lead levels in children have declined by 3-4 fold in the last 10 years, corresponding to the lead phasedown.

Air--Ambient Standards

EPA set the current National Ambient Air Quality Standard (NAAQS) of 1.5 ug/m^3 in 1978, as mandated by the Clean Air Act. (The Office of Air and Radiation was also responsible for developing this rule.) EPA set this standard based on the goal of keeping 99.5 percent of children below blood lead levels of 30 micrograms per deciliter (ug/dl). At that time, this level was thought to provide an adequate margin of safety from clearly adverse effects on the central nervous system and hemoglobin synthesis (anemia).

EPA is currently reviewing the NAAQS for lead. Since 1978, when EPA set the current standard, our knowledge and understanding of adverse health effects from lead has greatly expanded. Based on the available health effects information, EPA's Clean Air Science Advisory Committee recommended, in January of this year, that the Agency establish an ambient air standard that minimizes the number or percentage of children with blood lead levels above 10 ug/dl.

While there has been marked improvement in ambient lead levels across large urban or regional areas in the U.S., lead emissions from point sources can and do have significant impacts on a local scale. Locally elevated levels of air lead, especially lead settled in soil and dust, have been associated with elevated levels in humans. Approximately 55,000 children live in proximity of significant stationary sources of lead emissions, which include about four primary smelters/refineries, 23 secondary smelters and 87 battery manufacturers.

We continue to have problems of non-compliance with the NAAQS in the vicinity of many primary and secondary lead smelters. In most cases, facilities are in compliance with their state implementation plans (or SIPs, which implement the NAAQS under the Clean Air Act). However, those plans themselves are inadequate and must be revised. In other cases, there are problems at the facility that cause violation of the standard.

Air--Municipal Waste Incinerators and Smelters

Last November, EPA proposed revisions to its New Source Performance Standards (NSPS) for municipal waste incinerators under the Clean Air Act. NSPS cover all new facilities and existing facilities that make major modifications. These proposed rules apply the best technologies which have been demonstrated for use on each of the various sizes and types of incinerators. Lead is one of the pollutants that would be further reduced by this rule revision. One key provision is a ban on burning lead-acid storage batteries in such incinerators.

The Office of Air and Radiation is also reviewing the existing NSPS for secondary lead smelters as part of the Agency's lead program. This review will include a look at the best technologies currently available to control particulates, and alternatives for controlling fugitive emissions (not currently covered), as well as alternatives for specific lead emission limits. Any revisions to the existing standard would cover new facilities and existing facilities that make major modifications. Emissions from secondary smelters are particularly important in view of the Agency's interest in promoting lead recycling.

Drinking Water

While trends in ambient concentrations and average blood lead levels are encouraging, several important sources of lead exposure persist. Nearly everyone is exposed to lead in drinking water, although the vast majority of these exposures are at low levels. It is estimated that, depending on the individual circumstances, between 20 and 50% of total lead exposure in children is attributable to drinking water. EPA's Office of Drinking Water (ODW) has taken a number of steps to substantially reduce exposures by developing tighter standards for lead in drinking water at consumers' taps; identifying water coolers that are potential hazards and developing testing protocols to remedy such hazards; coordinating implementation of the 1986 ban on lead solder, and aggressively publicizing the need and means for reducing exposures to lead in drinking water.

In August 1988, EPA proposed rulemaking to lower the Maximum Contaminant Level (MCL) from 50 to 5 parts per billion (ppb) for lead leaving the water supply plant. Lead in drinking water results primarily from lead corrosion materials in distribution and plumbing systems. We also proposed a requirement that water suppliers minimize the corrosivity of their water, and conduct public education when lead levels measured in high risk homes exceed 10 ppb on average, or when the pH of delivered water is less than 8. Since proposal, we have received over 3000 comments and additional data. Evaluating this material has required considerable attention, but we hope to publish a revised lead regulation later this year. We anticipate that efforts by water suppliers to minimize their water's corrosivity will reap large public health benefits, as well as significant cost savings to utilities and consumers in terms of extending the service life of distribution and plumbing materials.

EPA has developed an outreach program to inform not only consumers, but schools, day care centers, and building owners on how to test for, and remedy, lead hazards in drinking water. EPA has delivered public service announcements to increase public awareness about the hazards of lead in drinking water. In addition, EPA established a hotline to answer questions from the public on lead; we currently respond to about 300 calls per month on lead in drinking water alone. The Office of Drinking Water (ODW) organized and delivered a number of training seminars to enable school, State and local government officials to train their personnel to implement the provisions of the Lead Contamination Control Act (LCCA) and the Lead Ban. (The LCCA calls for control of lead contamination in school drinking water;

the Lead Ban amended the Safe Drinking Water Act by banning the further use of lead solder and pipes connected to public water systems; it gives enforcement authority to the states.)

As a result of our public outreach efforts, numerous government agencies, private industries, and building owners have initiated their own programs to test for, and remedy, lead contamination from water coolers and other outlets. In January 1990, we published a list of water coolers that have lead-lined reservoir tanks and those with lead soldered parts. Since our initial list was published in April 1989, we have tested many additional coolers for possible lead problems. Our efforts to identify such coolers have provided the Consumer Products Safety Commission the necessary information to initiate hearings on possible recall actions.

We want to continue to examine Congress's 1986 limit of eight percent on the lead content of manufactured brass faucets and fixtures. EPA is looking at technological and regulatory alternatives to address the leaching of lead from brass faucets, including possible control under §6(a) of the Toxic Substances Control Act.

Water--Effluent Guidelines

Lead is a toxic pollutant under the Clean Water Act (CWA), subject to control under best available technology (BAT). Therefore EPA has limited the discharge of lead in all applicable BAT effluent guidelines developed after the 1977 CWA amendments.

These are technology-based standards, which include controls for (1) point source industrial wastewater discharged directly to waters of the U.S., and (2) pretreatment standards for such discharges to publicly-owned treatment works.

Under this authority, EPA has set standards for a number of industrial categories discharging lead, including mining, smelting, secondary lead recovery, and lead battery manufacturing operations. Over twenty industrial point source categories now regulate lead discharges in their wastewaters.

Water--Sludge

The Clean Water Act requires the Agency to establish standards that are adequate to protect human health and the environment from any reasonably anticipated adverse effects of each pollutant found in sewage sludge. Lead is one of the pollutants regulated in EPA's Part 503 sewage sludge rules proposed in February 1989. That proposal derived pollutant limitations using a risk-based methodology similar to those described above for the drinking water and NAAQS reviews.

The proposed sludge rules apply to various use and disposal practices including land application to agricultural and non-agricultural lands; distribution and marketing; sludge-only landfilling (monofills); surface disposal; and incineration. EPA's Water Office assessed both aggregate population risks and risks to the most exposed individual. The Agency's risk assessment indicates there is a low potential for public health and environmental impacts from the pollutants in sewage sludge, including lead. This is due to the relatively low levels of lead in sludge and the attenuating effect the sludge matrix has on the movement of pollutants. The majority of the potential lead-related health impacts from sludge disposal are attributable to incineration. The limitations in the proposal would result in the elimination of most of these impacts.

EPA has a policy of encouraging the beneficial reuse of sludge on land. Reuse of sewage sludge as a resource has a number of benefits, chief among them the fact that land application practices yield the lowest risks to public health and the environment. EPA is crafting the final Part 503 rule in a way that will continue to encourage the beneficial reuse of sludge and adequately regulate all practices including incineration to protect public health.

In the Part 503 proposed rulemaking, EPA set limitations on the acceptable lead content in sewage sludge for each disposal and use practice. The Office of Water will review public comments on the proposed rulemaking and move to promulgate a final regulation which includes appropriate controls on lead. In litigation on the promulgation schedule for this rule, EPA has submitted a schedule to the court which targets final promulgation in October 1991. When the regulation is issued, EPA and States will use these standards to establish limitations in permits for individual POTWs.

Lead in Paint

Perhaps the most serious and persistent lead problem today is deteriorating lead-based paint in older housing. Prior to 1988, EPA had some limited involvement in HUD's lead-based paint program. In 1988 we started taking a more active role, providing written comments on HUD's proposed rule (4/88), and briefing HUD on EPA's asbestos-in-buildings program, which presents some similar abatement issues. In the October 1988 Joint Conference Report for HUD and Independent Agencies, EPA and HUD were directed to negotiate a Memorandum of Understanding (MOU) on lead in buildings to provide for a "more appropriate and effective division of responsibilities." The Report said that EPA should use its broad authority under the Toxic Substances Control Act (TSCA), and its experience with the similar problem of asbestos abatement in buildings, to address lead-based paint testing and abatement standards, cleanup methods, and acceptable post-abatement lead dust levels.

The two agencies signed an MOU last April, and have been working closely since then. The MOU outlines several areas of EPA assistance to HUD, including technical and managerial assistance in the following areas: development of training and information centers, intergovernmental relations, identification of gaps in existing technical standards, new technical standard-setting, and public outreach/education.

HUD is scheduled to issue new paint abatement guidelines on April 1, to be used by public housing authorities. To help with that effort, EPA is currently developing training curricula for persons conducting abatement activities, and guidance for ensuring the quality of associated laboratory analyses of non-biological samples.

EPA's technical assistance role for 1990-91 includes initiation of a number of projects. The Office of Toxic Substances (OTS) is evaluating the feasibility of using some "low-tech" management practices--cleaning, covering railings and trim, and maintaining painted surfaces, for example, and assessing the long-term effectiveness of techniques used in the HUD Demonstration Project for removing or encapsulating lead-based paint. OTS is also developing course materials for a number of specific roles in the process, developing interim lab quality assurance guidance, chemical analysis support for conducting dust sampling and analysis. In addition, EPA's Office of Research and Development is conducting a major, multi-year research program on lead, including a number of projects that will help answer key questions on lead paint risks. EPA's funding for this work is $5 million and 15 FTEs in FY90.

Municipal and Industrial Solid Waste

There are a number of sources of lead in municipal solid waste. Primary sources of lead in municipal waste are lead batteries and printing materials. Municipal waste has been excluded from the definition of hazardous waste under the Resource Conservation and Recovery Act (RCRA), regardless of its constituents. EPA has municipal incinerator rules in effect; the

Agency is currently reviewing these rules and may revise them. We are also about to substantially revise our existing criteria for the design and operation of landfills.

EPA conducted an analysis of lead and cadmium containing products that enter municipal waste, and preliminarily identified those for which reasonable and less hazardous substitutes might exist including, for example, some uses of lead in inks and pigments or some solder uses. It is important to note that approximately 80% - 90% of lead-acid storage batteries are already recycled. EPA's Office of Solid Waste is currently considering options for separating batteries from the solid waste stream.

Waste contaminated with lead that tests as hazardous and is not classified as municipal waste, must be managed under Subtitle C regulations. Under Subtitle C, EPA has established pretreatment standards for lead in many wastes as part of the land disposal restrictions program. These standards require immobilization or recovery of lead before the waste can be land disposed.

The Bevill exemption (RCRA §3001(b)(3)(A)(ii)) excluded "solid waste from the extraction, beneficiation and processing of ores and minerals" from regulation as hazardous waste, pending completion of certain studies by EPA. Most waste generated by the primary lead processing industry--including two high volume wastes, acid plant blowdown and process wastewater--no longer hold their Bevill exemption under RCRA Subtitle C, which covers hazardous waste. Depending on the toxicity of the waste from these processes, they are subject to either Subtitle C or D (which covers solid waste) of RCRA. Subtitle C rules are already in place. Rules covering extraction and beneficiation of ores and minerals (including lead-bearing ores) under Subtitle D are still under development. A third high-volume waste generated by the lead industry--primary smelting slag--retains its Bevill exemption at present. However, this slag is part of an ongoing study of the mineral processing industry and might be regulated under Subtitle C, depending upon the outcome of the study. Otherwise, lead slag will be covered by the Subtitle D rules under development. Wastes from secondary lead smelters have always been regulated under Subtitle C if hazardous.

An important change that might affect regulation of slag is that, under new regulations, the Extraction Procedure (EP) test used to define wastes as hazardous will be replaced with the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP contains a grinding requirement for all wastes prior to performing the test, whereas the EP does not require grinding if the waste could pass a structural integrity test. Accordingly, slag wastes that were not previously subject to grinding are more likely to fail the TCLP.

Soils

Soils may contribute to childhood lead exposures, especially around major point sources, such as primary smelters, and in highly polluted urban areas. Soils contaminated by a long history of atmospheric lead deposition remain a potential hazard around roadways and closed industrial facilities. Soils around some industrial sources currently operating would remain a hazard even if lead emissions were to stop today. And lead-based paint has flaked or been scraped off buildings, resulting in significant lead contamination of soils. Recent changes in our testing procedures will probably raise the number of RCRA sites at which lead is a contaminant of concern. This is because preliminary analyses indicate that, for certain acidic lead-contaminated soils, the TCLP results in higher lead levels than does the EP test, which means that more lead-contaminated soils may fail the test, and be subject to the stringent hazardous waste handling requirements in the future.

Lead has been determined to be a major contaminant at approximately one third of the Superfund sites on the National Priorities List. There is currently no consistent soil-lead standard. Following the advice of the Science Advisory Board, EPA is doing further work in order to assess environmental exposure to lead based on preventing adverse neurological effects in children.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authorizes EPA to provide both emergency and long-term clean-up resulting from releases of hazardous substances. To determine cleanup levels Superfund uses either promulgated health-based standards or a risk assessment to determine whether the clean-up will protect human health. The MCL for lead presently provides the cleanup level at Superfund sites for water which may become drinking water. However, for soil there is no consistent standard. This is due in part to the fact that absorption of lead from dust and soil might not be the same under all circumstances. EPA is trying to improve its assessment of lead hazards from waste sites. The Agency is currently using guidance on clean-up levels for soil based on a 1985 Centers for Disease Control statement: a range of 500-1000 parts per million to protect children from inadvertent ingestion. In 1988, we co-sponsored an international workshop to discuss sampling and analysis of lead in soil, various exposure cases, and abatement approaches. At the present time, we are evaluating a biokinetic (i.e., biological metabolism)/uptake model to make site-specific determinations about acceptable soil lead levels at hazardous waste sites. We are working within the Agency to further develop the model, particularly to test and validate it at several Superfund sites.

EPA has funded 3 urban studies to evaluate the role soil plays in exposure and to assess widely-available, low technology lead abatement of soil and dust on children's blood lead levels. The Superfund Amendments and Reauthorization Act (SARA) set aside $15 million for these demonstration projects to evaluate the effectiveness of removal, decontamination, or other action to control lead-contaminated soil and dust. EPA established an expert panel for developing criteria to select sites and suggesting study design. Based on high soil-lead levels from paint and high child blood-lead levels, EPA chose Boston (study conducted by City of Boston), Baltimore (study conducted by the Maryland Department of the Environment), and Cincinnati (study conducted by the University of Cincinnati). EPA, CDC, NIEHS and other consultants are involved with the design and review of the results of the studies. CDC is also providing assistance to ensure the quality of blood sampling and analysis.

The studies are all underway. Measurements have been taken for child blood-lead as well as lead in soil, dust (interior and exterior), water and paint to which children might be exposed. Maximum soil lead levels range from 11,000 parts per million in Boston, to 5000 ppm in Cincinnati to 2000 ppm in Baltimore. In all 3 cities, activities include removing soil, exterior dust, and house dust. These studies will be completed early in 1991.

Near-Term Research Needs

EPA's Office of Research and Development is undertaking a program to gather additional information on lead exposure and abatement. EPA needs further information before it can control exposures to lead from sources beyond those already controlled by EPA regulations. Significant research is needed to assess total human lead exposure from all sources, lead toxicity and biokinetics (including bioavailability) and environmental contamination levels. Research is also needed to develop and evaluate abatement and control technology, in-place management techniques, remediation options, and better sampling and measurement techniques. Finally, because control and abatement of lead contamination will most often fall to local agencies (public housing authorities, schools, cities, private home owners, etcetera) and because abatement efforts can potentially increase exposure greatly, EPA's research strategy must include a technology transfer component.

ORD has outlined several critical areas for immediate attention.

1. Characterize the relationship between blood lead levels and lead levels in drinking water, soil, dust, paint and other identifiable pathways.
2. Evaluate existing mitigation and abatement techniques for lead paint, lead-contaminated soil, and lead in drinking water; possibly develop improved techniques.
3. Assess total environmental lead loadings, by source.

Pollution Prevention Program

In addition, EPA is also considering a number of pollution prevention initiatives to further reduce the risks from lead. The Agency is conducting a comprehensive effort to evaluate whether and, if so, how we should reduce further introduction of lead into the environment. This work is exploring the feasibility and desirability of regulatory action to discourage either the mining of virgin lead or the consumption of lead products, encourage recycling of lead-containing products, and/or encourage substitutes for lead, perhaps by eliminating nonessential uses of lead in products. Consideration is also being given to the use of alternatives to traditional command and control approaches for which new legislative authorities may be proposed.

Conclusion

To conclude, EPA has done a lot over the past two decades to address lead pollution problems. We have a lot of work underway. But we also know that there is much left to do, and we are in the process of refining a strategy to address those remaining problems. As our understanding of the threats posed by low levels of lead exposure continues to increase, we can better tailor our efforts to control its sources, limit exposure and contamination. While additional measures may be complex and expensive, we are working to ensure that such decisions are made on a sound basis and are only taken when necessary to provide higher levels of protection for all of our citizens, especially children.

Thank you again for the opportunity to speak before this Subcommittee. I will be happy to try and answer any questions you may have.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PESTICIDES AND TOXIC
SUBSTANCES

Honorable Harry Reid
Chairman
Subcommittee on Toxic Substances,
  Environmental Oversight,
  Research and Development
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

This is in response to your letter of March 22, 1990 concerning the follow-up questions to the March 8, 1990 hearing on lead before your subcommittee.

Enclosed are the answers to the questions and supporting documents where appropriate.

Sincerely,

Victor J Kimm

Victor J. Kimm
Deputy Assistant Administrator

Enclosures

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1) In December, 1989 an ad hoc joint study group on lead established by the Science Advisory Board concluded that the efforts of the various EPA offices working on lead were weakened by inconsistencies between the offices as to what population is at risk and the target blood lead level. The joint study group recommended that EPA develop a national policy on blood lead levels and focus on preventing adverse neurological effects in children from environmental exposure to lead.

A. Is EPA developing a national policy on lead and who is responsible for this policy development?

Lead is being regulated under a number of EPA's environmental statutes and the Agency programs and budgets are organized by these statutory authorities. EPA's Deputy Administrator Henry Habicht has committed the Agency to addressing the lead problem in an aggressive way, and has made it a high priority for all program offices. He has instructed Agency officials to focus on lead exposures and risks, media by media (that is air, water, soil, etc.) and to identify risks which are not adequately handled by existing standards.

B. How will the agency ensure that consistent approaches and goals exist throughout the agency's various offices?

EPA has an Agency-wide Office Director lead committee which is coordinated by the Office of Toxic Substances (OTS). This committee will be coordinating the program actions to ensure that they are based on a common understanding of the risks.

C. Is the agency going to focus on an agency-wide lead risk reduction program?

As part of its overall effort, EPA has established a lead pollution prevention project. This comprehensive program is committed to investigating ways to reduce risks from lead in the environment. This risk reduction effort also includes abatement of exposures to lead-in-place from past activities. This includes, among other things, providing technical assistance to the Department of Housing and Urban Development (HUD) for removal of lead-based paint in older housing, historical lead deposition in the vicinity of both operating and closed major point source emitters and lead concentrations in old landfills and dumps.

2) As things stand now, is there sufficient funding in EPA's budget for critical research on lead abatement and on removal of lead from soil in your proposed budget?

A. The Office of Research and Development (ORD) is involved in several multi-media research projects on lead abatement, including lead pollution prevention activities in the toxic substances and drinking water areas, and a major initiative beginning in 1990 developing lead abatement methods, identifying exposure pathways and measurements, establishing health and safety criteria, and developing information-sharing materials for lead in paint, soil, dust and water. ORD also provides assistance to the Office of Solid Waste and Emergency Response and Regional offices on soil lead abatement demonstration projects, enforcement and Superfund clean-ups. The ORD budget for lead abatement activities totals 2 workyears and $3.1 million in 1990, and 2 workyears and $600 thousand in 1991.

3) In January, 1990 the Clean Air Scientific Advisory Committee stated that children's lead exposure results from a range of environmental media - water, air, soil and paint - which requires "an integrated approach with appropriate standards for all routes of exposure."

A. What is EPA doing to reach this goal?

EPA has a number of activities underway to address these problems. We have an Agency-wide committee to coordinate our efforts on lead. As we have stated previously, this committee is charged with ensuring that all program activities are based on a common understanding of risks.

B. Has a hierarchy of exposure risks been established by the Agency?

EPA is concerned about a wide range of exposures levels. Lead causes a broad range of health and environmental problems. There are multiple routes of entry and lead may affect a wide spectrum of organs. For purposes of comparing the relative protectiveness of alternative regulations, EPA has focused on estimating the numbers of children exposed to lead above the level of 10 µg/dl as cited in regulations by the Office of Drinking Water and Office of Air Quality Planning and Standards.

EPA is currently reviewing additional lead exposure routes, including hazardous and municipal waste streams. Incineration of wastes that include lead are potential sources of exposures, and there is growing concern that fly ash from incinerators might pose significant risk. EPA has tightened that standards for air emissions of lead from these incinerators, and is examining the need to regulate the handling of waste oil, which contains heavy metals including lead. EPA has also proposed a new source performance standard for municipal waste combustors under the Clean Air Act to reduce the volume of lead incinerated as garbage. This rule calls for separating car batteries from the waste stream prior to incineration to encourage recycling. Lead emissions are reportable under the Emergency Planning and Community Right-to-Know Act (EPCRA) Toxics Release Inventory annually. Soils contaminated with lead are potential Superfund sites. EPA is also reviewing the National Ambient Air Quality

Standard for lead under the Clean Air Act to determine whether it should be more stringent.

C. **What role does EPA see for itself in addressing the specific problem of lead in soil and dust?**

Soils may contribute to childhood lead exposures, especially around major point sources, such as primary smelters, and in highly polluted urban areas. The legacy of contaminated soil resulting from lead in gasoline is a major concern in many urban areas, and lead-based paint has flaked or been scraped off buildings, resulting in significant lead contamination of soils. Lead has been determined to be a major contaminant at approximately one third of the Superfund sites on the National Priorities List. EPA currently considers levels of 500-1000 parts per million (ppm) of lead in soil to be a threshold range at Superfund sites. EPA is doing further work in order to assess environmental exposure to lead based on preventing adverse neurological effects in children.

EPA is trying to improve its assessment of lead hazards from waste sites and is evaluating a biokinetic uptake model that could be used to set site-specific soil lead cleanup levels at both RCRA and Superfund sites. Current Agency guidance on soil lead cleanup levels at Superfund sites is based on a recommendation contained in the 1985 Centers for Disease Control statement on childhood lead poisoning. We are testing methods to better evaluate acceptable soil levels at hazardous waste sites. EPA has funded three urban studies to evaluate the role soil contaminated with lead-based paint plays in exposure and to assess the effect of widely-available, low technology lead abatement of soil and dust on children's blood levels. The studies are all underway and we expect these studies to be completed in 1991.

D. **What is the agency doing to address the problems of lead paint in housing?**

The lead for the Federal program to address concerns about lead paint in housing has been assigned to HUD. EPA is providing assistance to HUD. Areas in which EPA believes it can be helpful include: evaluation of longer-term efficacy of abatement methods; development of improved methods to identify units in need of abatement; development of targeting procedures, criteria for initiating abatement, and procedures for in-place management technology; development of the trained work force, and improvement of public awareness and networking.

E. Describe the nature of EPA's cooperation with HUD?

As indicated in testimony by both EPA and HUD at the March 8 hearing, there is high degree of cooperation between the organizations. EPA has been very responsive in assisting HUD in the implementation of both the technical and logistical aspects of their congressionally mandated responsibilities.

4. What does EPA propose to do about the problem of water which has acceptable levels of lead at the source, but a high lead content at the tap?

A. In 1988, EPA proposed a dual approach for controlling lead in drinking water. The first part of the proposal called for a minimal level of lead in sources entering the distribution system. The second part, a treatment technique requirement, was designed to control the corrosion of lead from materials in distribution and plumbing systems.

EPA is finalizing revisions to the lead in drinking water regulation. The Agency still believes it is important to monitor for and control lead corrosion by-products in tap water to which people are exposed. Therefore, EPA envisions that the final rule will still include requirements for corrosion control.

B. Will EPA propose a program for testing tap water?

In the 1988 proposal, EPA did propose requirements for testing lead levels in tap water. In order to determine the level of lead exposure from drinking water, it is important to monitor the lead concentration at consumers' taps because lead enters drinking water after leaving the treatment plant and reaches a peak level at the consumer's tap. EPA is considering a program for tap testing because if water suppliers do not collect home tap samples for lead, they would have no indication of the lead levels their customers are being exposed to, and thus could not rectify the portion of the problem that is under their control (i.e. corrosiveness of water, lead service lines). EPA has already mobilized citizen action through programs to inform the public about lead in drinking water and how to test for it. These programs include guidance and a testing protocol for schools as required by the Lead Contamination Control Act.

C. Is EPA studying corrosivity treatment techniques for public water supplies to prevent lead from leaching from the pipes and solder into the water?

Yes, the Agency has studied and continues to study this matter. Studies indicate that there is a significant reduction of lead levels after corrosion control treatment has been optimized. The August 18, 1988 proposed rule (enclosed) discusses corrosion control technology in greater detail. The proposal requires that optimal corrosion control be used to minimize lead in drinking water.

5. It would appear that children are susceptible to lead exposure from a number of sources: lead paint, household dust, contaminated soil, drinking water and so forth. Given what I believe is known in EPA-jargonese as the "multimedia" nature of the lead problem, could you comment on any difficulties that the EPA has experienced in addressing the problem as a result of the agency's structure?

A. The Agency is coordinating several program activities on lead since lead presents risks in several media. The program benefits from the special expertise developed in responding to risks from other environmental contaminates in each of these media (that is water, soil, air, etc.). We are seeking to bring this expertise together to address each exposure in the most effective way possible. As we have stated earlier, the Agency has in place a committee to assure that a hierarchy of risks is established and that all program activities are based on common risk assumptions We believe that the Agency's current structure allows the most effective response to the lead problem.

B. What is the EPA's budget for addressing lead contamination? Among which Offices is it divided?

EPA's budget for lead activities totals 49.7 workyears and $10.8 million in 1990, and 49.2 workyears and $9.4 million in 1991. Individual office subtotals are as follows:

EPA Lead Activities
(dollars in millions)

Office	FY90 Current Est.		FY91 Pres.Budg.	
	FTE	Total$	FTE	Total$
OW	13.0	$1.5	12.8	$4.0
OSWER	--	--	2.5	$0.5
OPTS	15.0	$2.9	15.0	$1.1
OAR	19.7	$3.3	16.9	$3.2
ORD	2.0	$3.1	2.0	$0.6
AGENCY TOTAL	**49.7**	**$10.8**	**49.2**	**$9.4**

6. An EPA memo on the lead pollution prevention program (P4) workplan by Edward Brooks, dated January 25, 1990, states that the Agency had not decided on the role that the Office of Research and Development should play in the project. Has a decision now been made concerning the role of the ORD?

A. Decisions concerning the specific work to be performed by the Office of Development in the Lead (Pb) Pollution Prevention Program (P4) have not yet been made. P4, which is to commence on October 1, 1990, is still in its initial planning phase. Until the program is more developed, it would be premature to specify the work to be conducted by ORD. This was expressly agreed to by the oversight Office of Pollution Prevention. A decision regarding ORD's role in P4 will take place in late summer.

7. The ATSDR made a number of recommendations regarding methods of reducing exposure to lead in a 1988 study. Could you detail what actions the EPA has taken to follow-up such recommendations?

A. EPA is participating in an interagency committee chaired by the Agency for Toxic Substances and Disease Registry (ATSDR) to review the implementation of recommendations in the ATSDR report to Congress. As mentioned above, EPA is providing technical assistance to HUD with its lead paint program.

Considerable effort is underway to implement these recommendations. Of particular note are the following EPA efforts:

- an EPA demonstration project in Boston, Cincinnati, and Baltimore to remove lead from urban residential soil;
- several projects and reports that will address lead in paint;
- an in-place management program for limiting lead exposure in dwellings, including exposures from lead in drinking water and soil.

8. Under a Memorandum of Understanding, the EPA has been working with HUD to address the problem of lead-based paint in public housing.

A. What difficulties have been encountered in working with HUD?

See answer to 3E above.

B. How have EPA and HUD divided responsibility?

See answer to 3D above.

C. How is the debris from lead abatement disposed?

The debris is disposed of in municipal landfills and RCRA hazardous waste disposal facilities. EPA has received some preliminary results from HUD's demonstration project. The largest amount of the debris, either by weight or by volume, generated in the course of the abatements and analyzed up to this time does not meet the hazard criteria set by current Resource Conservation and Recovery Act (RCRA) regulations. However, some material which has been analyzed does meet the hazard criteria. It is generally low-volume, and relatively high in lead.

D. Is it treated as general construction waste or as hazardous waste?

The answer is both. EPA is in the process of developing a procedure to determine when lead needs to be disposed of as hazardous waste. EPA believes that it is appropriate that such material, which meets the hazard criteria specified under RCRA, be treated as a hazardous waste. These tests are designed to determine whether lead is likely to migrate from the waste under conditions like those found in landfills. We will examine the fraction of waste likely to meet hazard criteria of the pending RCRA regulations. These regulations will call for use of a new test called the Toxic Characterization Leaching Procedure (TCLP) test.

EPA believes that the potential hazard of wastes which meet the existing criteria is relatively high and further believes that the costs of compliance with pending regulations will be low. Preliminary results suggest that the costs of disposing of the hazardous fraction of abatement debris may not be an appreciable fraction of the cost of abatement, and may run as low as $50/dwelling.

9. It has been claimed that much of the top-soil of the Northeast-Midwest of this country is contaminated with lead.

A. If this is the case, how feasible is abatement?

The ATSDR report has looked at the nature and extent of lead poisoning in children in the United States. The estimated number of children exposed to lead in dust/soil is in the range of 5.9 to 11.0 million. EPA is studying abatement methods in the course of our technical assistance to HUD.

We have not evaluated the feasibility of national abatement for paint-contaminated soils. Of the sites listed on the Superfund National Priorities list, 407 contain lead, 183 of these sites are in the northeast and midwest areas of the country. Lead-contaminated soils tend to be more a problem in urban areas.

B. What would you estimate the cost of such a project to be?

EPA has no data on such costs.

10. The schools in Washoe County, Nevada, have been found to have lead-contaminated drinking water.

A. What is the EPA doing to address the problem of safe drinking water in Nevada?

The Nevada Health Division has primary enforcement authority for the Nevada Public Water System Supervision Program (PWSSP) as authorized under Section 1413 of the Safe Drinking Water Act (SDWA). Our understanding of the test results from the Washoe County school district is that of approximately 300 outlets (water coolers and faucets), eight or nine outlets, all in new buildings, had lead levels above EPA's recommended level of 20 parts per billion. None of these outlets were water coolers; all were either bubblers or brass faucets. The problems were traced to internal plumbing (i.e., new lead-containing solder) or new brass faucets which contain small amounts of lead.

In compliance with the Lead Contamination Control Act (LCCA), EPA developed testing protocols and guidance for identifying and remedying lead hazards in school drinking water. This guidance was distributed to every State. We also contacted the Governors to request them to designate a person to implement the LCCA. In addition, the Agency conducted training seminars in five Regions for State and school officials to train State and school personnel test for and remedy lead contamination in school drinking water. A representative from Nevada attended one of these seminars, conducted in Washington, which led to five seminars being conducted in Nevada. As is the case for many other States, such seminars resulted in the testing, and in some cases, remediation, of lead problems in school drinking water.

At the March 8 Hearing, Mr. Jeffrey A. Fontaine, of the Nevada Department of Human Resources, detailed the activities that Nevada has taken to measure levels in the water supply and school drinking fountains. For more information on this matter, you may contact Mr. Fontaine at (702) 687-4750.

11. Some people have suggested that there are strong parrallels between lead and asbestos.

A. Do you see such similarities?

A. The main similarity is that lead and asbestos were both widely used in buildings, which created environmental problems that were not envisioned with their initial use. EPA and HUD are looking at abatement methods for lead that may parallel the methods for asbestos abatement. In addition, both lead and asbestos require specially trained professionals to conduct abatement. Worker protection issues are important for both lead and asbestos abatement. Strong risk communication efforts are essential in order to avoid a "removal mentality," which has been pervasive with asbestos. Other forms of abatement, such as encapsulation, may be useful for treating lead contaminated paint in buildings.

12. Do you know if anyone has done an economic analysis of the total cost of a nationwide lead abatement program?

A. The Office of Toxic Substances is preparing to conduct an economic analysis of costs associated with the Agency's activities. At this time, the analysis is not complete.

However, before we conduct an economic analysis of a national abatement program, we must first determine the efficacy of whatever abatement techniques would be used. The Agency is working to develop this information.

B. How much would you estimate such a program to cost?

HUD is now developing, through its Demonstration Project on Abatement Methods (DEMO) cost figures for techniques currently used in abatement. If per-dwelling costs averaged $10,000, costs for abating 41 million dwellings would be $410 billion. This suggests that research to find cheaper methods of abatement than those now in use is likely to be necessary.

In the Fall of 1990, HUD will finalize the "Comprehensive and Workable Plan," which will address the problem of lead-based paint identification and abatement in all public and privately owned housing.

EPA does not have cost estimates developed for such a program.

Testimony of John C. Weicher, Assistant Secretary for Policy Development and
Research, Department of Housing and Urban Development Before the Subcommittee
on Toxic Substances, Environmental Oversight,
Research, and Development Subcommittee of the Senate
Committee on Environment and Public Works
March 8, 1990

Testimony of John C. Weicher, Assistant Secretary for Policy Development and Research, Department of Housing and Urban Development Before the Subcommittee on Toxic Substances, Environmental Oversight, Research, and Development of the Senate Committee on Environment and Public Works

March 8, 1990

Good morning, Mr. Chairman and members of the subcommittee.

First of all, I would like to thank you for this opportunity to appear before you to discuss the Department's activities and accomplishments related to lead-based paint. I would like to note that my testimony will focus on lead-based paint in housing and will not address other sources of lead.

The Department of Housing and Urban Development is actively pursuing its various mandates to address lead-based paint in housing. These statutory requirements are the result of amendments to the Lead-Based Paint Poisoning Prevention Act of 1971, as contained in the Housing and Community Development Act of 1987 and the Stewart B. McKinney Homeless Assistance Amendments Act of 1988. In the research area, the 1987 and 1988 amendments required HUD to undertake a national demonstration to determine the most efficient and cost-effective methods for abating lead-based paint in housing and to develop a plan for the abatement of lead-based paint in both private and public housing. I am happy to report that the Department is making significant progress in these activities, as well as in the development of testing and abatement interim guidelines to govern abatement efforts in Public and Indian Housing.

The status of specific projects is as follows:

1. The abatement demonstration of HUD-owned housing is substantially under way. By the end of 1990, we expect to have completed the abatement of some 173 units in five metropolitan areas: Baltimore-Washington; Birmingham, AL; Indianapolis, IN; Denver, CO; and Seattle-Tacoma, WA. From this

demonstration, we expect to acquire important new knowledge about the cost of various abatement methods; their relative effectiveness; and the impact on worker safety. We now expect to spend about $6 million on the FHA abatement demonstration, some $2 million more than originally anticipated. Much of the demonstration expenditures are the result of special research requirements for testing, comparison of abatement methods, extensive data collection, and monitoring. Secretary Kemp has notified the appropriate Congressional committees of the reprogramming of an additional $2 million in FHA funds to complete this demonstration.

We do not yet have information about per unit costs. We do know that less extensive efforts (interior only) in private housing in Baltimore, for example, are costing $3,000-$10,000 per unit.

The inventory of HUD-owned housing stock does not contain multi-family units with lead-based paint. We believe, however, that the Public Housing Abatement Demonstration will adequately address abatement concerns regarding multi-family housing.

2. The abatement demonstration of public housing is getting started. Three public housing authorities are participating: Cambridge, Massachusetts; Albany, New York; and Omaha, Nebraska. Approximately 100 units will be involved. Initial testing has been completed in Omaha and testing commenced in Cambridge last week. In addition to examining the same issues which I just mentioned for the FHA demonstration, we will be closely examining the issue of dust spread in multi-family structures. This will help determine whether entire structures must be vacant before any abatement can be safely carried out or whether modifications to this policy can be made. We expect to complete the Public Housing Demonstration by the end of the year.

3. The examination of existing lead-based paint testing technologies has been completed for HUD by the National Institute of Standards and Technology (NIST). The major finding of this report is that the most popular detection technology, portable X-ray fluorescence machines, is not as accurate as we expected. This is causing us to require supplemental laboratory testing for many readings that fall into an uncertain range. The additional testing is both time- consuming and costly. It is, in fact, one reason for the increase in cost of the FHA abatement demonstration. Therefore, we are exploring the possibility of developing an improved detection technology to address this problem.

4. A report on the development of a comprehensive and workable plan for the abatement of lead-based paint in private housing is scheduled for September 1990. We are making every effort to meet this deadline. As part of this plan, we expect to provide a series of policy and program recommendations to mitigate this public health hazard based on the research results obtained as of that date. We are concerned that any national program be carried out in the most cost-effective manner possible.

A similar comprehensive and workable plan for public housing will be prepared in 1991, after the completion of the abatement demonstration in public housing.

Related to the development of these plans, the Department is currently carrying out a national survey to estimate the incidence of lead in the nation's housing stock. This survey will examine the levels of lead concentration in paint and its geographic distribution, and will assist us in estimating the cost of abatement nationally. Most importantly, the survey, the first national effort of its kind, will provide a more definitive determination of the extent of the lead-based paint hazard in this country rather than continuing to rely on a variety of estimates derived from secondary sources.

5. A major effort of the Department is the implementation of interim guidelines for the testing and abatement of lead-based paint in public housing on or before April 1, 1990. The interim guidelines are the result of an intensive effort which began in August 1988 when HUD contracted with the National Institute of Building Sciences to develop such guidelines. In view of certain concerns over the guidelines completed by NIBS in March 1989, HUD convened a working group of experts and knowledgeable persons in the field to revise the document, including physicians and lawyers who will testify before this Subcommittee later today. A draft of that document was completed in September 1989. It has been extensively reviewed and edited by EPA. The guidelines contain procedures for use by Public Housing Agencies and Indian Housing Authorities in the following areas:

- Testing
- Abatement
- Worker Protection
- Cleanup
- Waste Disposal

Because of the complexity of the guidelines, much training will be required. We have worked with EPA to develop a model curriculum for a general training session on the guidelines and a work plan for additional training which may be required, e.g. training for inspectors, designers, and contractors. In addition, as findings from ongoing research in HUD and other agencies become available, we are committed in making whatever modifications are necessary. The interim guidelines will affect all modernization efforts conducted under the Comprehensive Improvement Assistance Program (CIAP). The testing requirements of the interim guidelines will be used to carry out the Department's mandate to test all pre-1978 public housing units by 1994, a deadline which we are fully committed to meet.

6. We are also in the process of developing an interim containment plan for public housing which will provide guidance on how to reduce the lead-based paint hazard in units not scheduled for abatement in the near future. Since HUD cannot immediately abate all units determined to contain a hazard, this is a critical interim approach emphasizing on-going maintenance.

7. At this time, I would like to acknowledge the important support which we have received from other Federal agencies in this effort. In April 1989, HUD and EPA executed a Memorandum of Understanding on Lead-Based Paint. EPA has been extremely helpful in many research and technical assistance activities, the most recent being EPA's major role in developing a national training program to support the implementation of the interim guidelines. In addition to EPA, we have received substantial assistance from the National Institute of Occupational Safety and Health (NIOSH) in carrying out studies of worker exposure to lead and other chemicals. We also consult regularly through the HUD-EPA Task Force on Lead Based Paint (created under the Memorandum of Understanding) with the Centers for Disease Control, the Consumer Product Safety Commission, the National Institute of Environmental Health Sciences, the National Institute of Standards and Technology, and Occupational Safety and Health Administration of the Department of Labor.

I want to underscore our commitment to addressing this important public health issue. We have committed substantial staff and resources and have made this an important priority. We will continue to pursue this matter with the same level of diligence and look forward to sharing the products of these endeavors with you.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410-6000

ASSISTANT SECRETARY
FOR POLICY DEVELOPMENT AND RESEARCH

May 18, 1990

Honorable Harry Reid
Chairman, Subcommittee
  on Toxic Substances, Environmental Oversight,
  Research and Development
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Senator Reid:

I am writing in response to your letter of March 22, 1990, in which you asked a number of follow-up questions to the March 8, 1990, hearing before your subcommittee.

The Department's responses to your questions are enclosed. We have attempted to answer them to the best of our ability. Should you wish to discuss them further, please do not hesitate to contact me.

Again, I want to thank you for the opportunity to provide testimony.

Sincerely,

John C. Weicher

Enclosures

QUESTIONS FOR THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Q.1. Under what circumstances will HUD remove lead-based paint, or require the removal of lead-based paint from HUD housing?

A. When it is determined through portable XRF (and if necessary supplemental AAS) testing that the interior or exterior of a unit contains LBP at or above either 1.0 mg/cm^2 as measured by (XRF) or .5% as measured by (AAS), abatement will be undertaken.

Q. Does requiring removal only after a child shows blood lead levels serve a successful preventive purpose?

A. If a child is diagnosed as having elevated blood lead levels (above 25 ug/dl), the unit in which the child lives will be immediately tested and abated if it is at or above the thresholds cited above. It is preventive only to the extent that the child, once treated, will not be repoisoned.

Q. Is it sufficient to remove paint only when it is chipping and peeling, when paint dust, even from walls which look intact, presents a problem as serious as actual paint chips?

A. Intact lead-based paint will be abated (removed or encapsulated) as well as non-intact paint if it has a lead content at or above the thresholds cited. We no longer respond in public housing only to non-intact paint on surfaces.

Q. Is complete removal necessary under all circumstances of chipping paint, or are there interim and more moderate procedures which will also prove effective?

A. In cases where paint is peeling or chipping, all loose paint must be removed. Then a decision must be made to remove all intact paint as well or to encapsulate all LBP surfaces. Various types of interim procedures are now being considered under the Department's In-Place Management Plan for the control of lead-based paint hazards prior to abatement. Use of HEPA vacuums and tri-sodium phosphate wash-downs are two interim procedures which may prove to be effective as part of an In-Place Management Plan.

Q.2. What government agency is responsible for lead paint in private housing?

A. At this point, no Federal agency has been given regulatory responsibility for lead-based paint in private housing. This is one of the matters to be addressed under the Comprehensive and Workable Plan for private housing which the Department will submit to Congress by September 6, 1990.

Q.3. What does HUD believe is the extent of the problem in the nation's private housing?

A. The National Hazards Estimate which is currently being prepared by the Department will determine the extent of lead-based paint in the nation's private and public housing. A field survey is complete and the results will be presented with the Comprehensive and Workable Plan in September 1990.

Q.4. What is the extent of the problem in housing for which HUD provides Section 8 certificates of vouchers?

Should HUD screen these units before it approves or renews the use of vouchers or certificates?

A. We do not know the extent of the lead-based paint problem in units for which Section 8 certificates or vouchers are being provided.
The Department is currently studying the best way to address the issue of lead-based paint in Section 8 housing and will decide what actions it should take as a result of this examination.

Q.5. What is your impression of the extent of the problem in public housing? Has there been a HUD survey of some sort? If not, how do you derive your estimates?

A. The extent of the lead-based paint problem in public housing is being determined through the field survey currently underway as part of the National Hazards Estimate. This will be available in September 1990.

Q.6. What abatement techniques has HUD been investigating?

What measures does HUD consider necessary to protect the health of residents in a unit undergoing abatement?

Has HUD developed recommendations for interim abatement measures if complete abatement is unavailable or impossible immediately?

A. HUD is studying a range of abatement techniques under the abatement demonstrations. These include enclosure, encapsulation, mechanical removal, chemical removal, hand-scraping, and replacement of building elements. We will be able to make determinations about costs of the various methods and the ease or difficulty of achieving clearance of the units (largely a function of how much dust the methods generate). We will not be able to evaluate or endorse specific brand name products, however.

With regard to health of the residents, the abatement demonstration is carefully examining the spread of lead dust during abatement using different abatement methods, to determine whether evacuation of an entire structure is necessary. As noted, HUD is currently developing recommendations for interim abatement measures when units containing lead-based paint are not to be abated immediately.

The 1987 Housing Act and 1988 Amendments established an agenda for the testing and abatement of lead-based paint in public housing.

Q. How well is HUD equipped to deal with the responsibilities given to the Department under these statutes?

The identification and abatement of lead paint affects several major Departments, including HHS, EPA, Labor, and HUD. It would not be possible for HUD to carry out its housing abatement responsibilities without the technical expertise and assistance of these agencies. Moreover, HUD does not have the capability in such major areas as determining safe levels of exposure for workers or determining safe levels of lead on surfaces for reoccupancy, after abatement. With regard to research, HUD is capable of conducting research with the assistance of other Federal agencies with specialized expertise such as NIST, EPA, and NIOSH.

Q. How would you characterize the cooperation that HUD has received from EPA?

A. In April 1989, HUD and EPA executed a Memorandum of Understanding on Lead-Based Paint. EPA has been extremely helpful in many research and technical assistance activities, the most recent being EPA's major role in developing a national training program to support the implementation of the interim guidelines. In addition to EPA, we have received substantial assistance from the National Institute of Occupational Safety and Health (NIOSH) in carrying out studies of worker exposure to lead and other chemicals. We also consult regularly through the HUD-EPA Task Force on Lead-Based Paint (created under the Memorandum of Understanding) with the Centers for Disease Control, the Consumer Product Safety Commission, the National Institute of Environmental Health Sciences, the National Institute of Standards and Technology, and Occupational Safety Health Administration of the Department of Labor.

Q. What do you think should be EPA's role in abating lead-based paint in public housing?

A. EPA has an important research role to perform in the establishment of standards for lead-in-paint, lead-in-dust and lead-in-soil. The determination of what constitutes an unacceptable level of lead from an environmental health perspective is critical in order to establish realistic and cost-effective abatement strategies. In addition, EPA's scientific capacity is ideally suited to addressing a host of research issues such as product evaluation and certification, and the relationship between various lead pathways and blood lead levels. HUD's strength is in housing issues on the operational side, especially the planning and management of LBP abatement in conjunction with modernization.

Q. Does an abatement superstructure exist to support HUD's efforts to reduce exposure to lead in public housing? Who actually does the abatement?

A. Based upon the experience to date in the HUD-owned property Lead-Based Paint Abatement Demonstration, there is considerable evidence to indicate the absence of a competent infrastructure to assist HUD in carrying out any abatement efforts (this appears to be less true in Maryland and Massachusetts which have had active state LBP efforts for years). HUD has had difficulty in finding contractors and in those cases where willing contractors are found, their inexperience and fear of the unknown has led to inflation of the bids in order to protect themselves. As LBP abatements increase, a competent industry will probably grow but the transition will be difficult and take place over many years.

A. What training do lead abatement workers receive?

Under the abatement demonstrations, LBP abatement workers receive six hours of safety training which deal with a variety of worker protection issues. In addition, they receive on-the-job training in how to apply various abatement techniques.

In terms of developing a national abatement industry, HUD, with EPA assistance, has prepared a general training program which will be implemented shortly. In addition, specialized training programs for contractors and other specialists will be developed during this calendar year. Such training will cover testing, abatement, clean-up, waste disposal, and worker protection.

Q. How active has OSHA been in setting guidelines on worker safety?

A. Although OSHA has enacted regulations which has some applicability to lead-based paint abatement (29 CFR 1910 and 1926), the regulations are vague, medically out of date(i.e. removes workers whose blood lead levels exceed 50 ug/dl, far above the 30 ug/dl prescribed in Maryland, which is based on more recent medical research), and often advisory rather than prescriptive. There have been no recent changes to the OSHA regulations.

Q. How accurate is the XRF machine in measuring lead levels in houses?

A. The National Institute of Standards and Technology report entitled "Methods for Measuring Lead Concentrations in Paint Films" prepared for HUD in 1989 under an inter-agency agreement indicated that the portable XRF analyzers are less accurate than desired. Specifically, the report states "that the best estimate of precision of measurements made over wood, plaster and drywall is 0.6 mg/cm^2. (This implies that 95 percent of the time, the true concentration should be within about +/- 1.3 mg/cm^2 of the experimental outcome and that 67 percent of the time, the true concentration would be within +/- 0.8 mg/cm^2 of the experimental outcome.)" One way to partially overcome this bias is to make the initial measurements on the bare substrate material, after scraping off any surface paint. To compensate for this, supplemental atomic absorption spectroscopy testing is required for many XRF tests falling into an uncertain range, adding both costs and time.

Q. Does a building have to be unoccupied for abatement to take place? If it does, is abatement on a nation-wide scale a feasible proposition?

A. The public housing component of the abatement demonstration is addressing dust spread issues in order to determine if entire structures must be unoccupied during abatement. Specifically, the abatement demonstration will employ continuous air monitoring in all units of unoccupied structures to assess dust hazards generated by various abatement techniques. If it is determined that entire structures must be vacant when units are being abated, this will cause major obstacles to future National efforts. The disruption of families, the costs of relocation, and the absence of relocation resources are very formidable impediments which would have to be successfully worked out.

Q. To the best of your knowledge, has anyone done an economic analysis on the total cost of lead abatement? What would you estimate the cost of such a program to be?

A. The Comprehensive and Workable Plans (for private housing and for public housing) will provide estimates of the costs of lead-based paint abatement for both public and private housing. We are not prepared to make an estimate at this time, however. The estimates for private housing will be available in September 1990, for public housing in June 1991.

American Academy of Pediatrics

TESTIMONY

BEFORE THE

UNITED STATES SENATE

SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT,
RESEARCH AND DEVELOPMENT

OF THE

ENVIRONMENT AND PUBLIC WORKS COMMITTEE

ON

LEAD AND ITS EFFECT ON CHILDREN'S HEALTH

Presented by:
Herbert L. Needleman, M.D.
March 8, 1990

Department of Government Liaison
1331 Pennsylvania Avenue, N.W.
Suite 721 North
Washington, D.C. 20004-1703
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Good morning Mr. Chairman. I am Herbert L. Needleman M.D., a member of the Committee on Environmental Hazards of the American Academy of Pediatrics and appear today on the Academy's behalf. I am also a professor of psychiatry and pediatrics at the University of Pittsburgh. The Academy welcomes this opportunity to appear before this committee to discuss the impact of lead at low dose on the welfare of children. We are very concerned about the epidemic of undiagnosed lead poisoning in this country and recognize this as one of the most important public health problems in the United States. This is a subject my colleagues and I and many other pediatricians have been investigating for 20 years. I submit for the record two publications on this subject supported by grants from the federal government which were published in January and February of this year. One is from the New England Journal of Medicine, and reports the long term effects, in adulthood, of exposure to lead at low dose as a child. The second is from the Journal of the American Medical Association, and is a quantitative review of all the published modern studies of lead at low dose.

In today's remarks, I will make the following points: 1) Lead poisoning is one of the most serious pediatric health problems in the United States today and; 2) Lead poisoning is completely preventable.

Lead toxicity, like many environmental threats, is a product of human activity and choice. Our understanding of the

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NOTE: Attachments to this statement have been retained in committee files.

nature of the disease, its origin, and its remedy has grown rapidly in the past 5 years. But effective prevention, with the exception of gasoline, has been feeble and halting. The defined threshold for toxicity in children, once considered to occur at 40ug/dl, has been reset at 10-15ug/dl by the Federal Government on the basis of the latest science. Our better understanding of the level at which lead toxicity occurs means that 3-4 million American children are at risk for brain damage. It is this effect of lead poisoning on so many children that makes it one of the most serious diseases of childhood in the United States.

Newer studies of the biology of lead exposure have demonstrated effects in systems heretofore not known to be vulnerable, at doses heretofore thought to be harmless. Epidemiological studies of children using larger samples, better identification and control, and more sophisticated statistical modelling have shown deficits at lower blood levels of lead. There is no level shown to be safe. Quantitative reviews of the literature have led to a striking convergence of scientific opinion on the effects of low doses of lead on the IQ of children. Dispute of the fact that low blood levels of lead damage children is now only raised by the uninformed or by those whose economic interests would be affected by effective control of the toxicant.

I want to briefly review what we know about low level lead exposure and children's IQ's. There are 24 modern studies of this relationship in the literature. Because of the limitations of time, I will concentrate on the work of my group, begun when I was at Harvard Medical School. We used, for the first time in outcome studies, dentine lead as the exposure marker; we measured IQ and other behaviors by a number of sensitive tests; we controlled for 39 factors that could confound; and we selected our sample in an unbiased fashion. We found that having more lead in one's baby teeth was associated with lower IQ, speech and language handicaps, and poor attention. Reports from teachers, unaware of the children's lead levels, showed that as tooth lead went up, bad classroom behavior became more common. This study, published in the New England Journal of Medicine in 1979 at the time the EPA was struggling with developing an air lead standard, was used by the administrator to recommend reducing lead in the atmosphere and in gasoline.

We followed 249 of these infants at 1, 6, 12, 24, 48, and 57 months of age, and found that prenatal exposure to lead was related to delayed mental development as late as 24 months of age. At 57 months, the effect of postnatal exposure to lead became dominant, although the prenatal effect was still measurable in the children of low socioeconomic status. These children continue to be followed, and we hope to track them into adolescence. The high lead group had blood levels above 10 ug/dl. There are 400,000 children born each year in that range.

We have followed the subjects from our tooth study into adulthood and find results that are even more disturbing. This was reported in the *New England Journal of Medicine* in January. Having high lead in one's teeth carried a seven-fold increase in the risk of nongraduation from highschool, and a six-fold increase in the risk for reading disability. The social costs for this exposure are staggering. Lead is one of the preventable causes of school failure and reading disabilities. In addition, we have shown that small shifts of the distribution in IQ scores in relation to lead exposure quadruple the risk for an IQ below 80. They also reduce the number of children at the top end of the distribution. This means that the number of children with IQ's over 125 will be reduced by 50%. In a population of 200 million, this means about [illegible] million people will be deprived of achieving a superior level of competence. It is not only a personal disaster but also a national disaster.

Studies of lead exposure have focused on IQ, but there is good reason to believe more critical changes in the brain can be expressed in other behaviors. We and others have shown that lead toxicity is associated with attention deficits and hyperactivity. This collection of behaviors has dire implications for adjustment to society.

On the basis of these studies and many similar reports from the United States, Europe and Australia, the Agency for Toxic Substances and Disease Registry, in its recent Report to

Congress, has concluded that neurotoxicity from lead begins at blood lead levels as low as 10-15 ug/dl. This means that one American child in six has toxic amounts of lead in his or her blood, and that 400,000 newborns are delivered bearing toxic levels each year. Lead is not a problem for poor inner city minorities alone, but they receive an excessive dose. For black children in poverty, the rate of blood leads over 10ug/dl is 55%! This datum, one of the most frightening public health statistics, has received only passing attention since the ATSDR report. It means that lead exposure is among the most serious American public health problems for some segments of our population.

One is forced to ask why lead poisoning, long known, not nearly as complex as AIDS or cancer, has not been remedied. Four possible explanations include: 1) Lead poisoning is a disease of the poor; 2) Removing lead from gasoline, water, and housing is too costly; and 3) It impacts severely on the lead industry. (In 1933, almost 60 years ago, the Lead Industries Association exerted pressure to alter regulations that would have limited the use of white lead in building paint); and, 4) Government has not recognized the dimensions of the problem. Egregious in this respect, HUD has failed to protect residents living in HUD owned or supervised property from lead poisoning. This is an expensive enterprise. In two million homes in our nation children are exposed to excess environmental lead. Ways must be found to eliminate this health hazard.

Modern industrial workers increasingly need to be literate, and competent in mathematics and problem solving. Management is currently having difficulty recruiting educable workers. We have seen persuasive evidence that one of the identifiable causes of school failure and reading disabilities is lead.

Lead poisoning is no mystery; the toxin's presence, its effects, and the steps to removing it forever are plainly prescribed. This government, with vision and commitment, can in a decade be credited with having wiped out this terrible, ubiquitous, silent destroyer of our children's brains and futures.

University of Pittsburgh
WESTERN PSYCHIATRIC INSTITUTE AND CLINIC

March 29, 1990

Senator Harry Reid
Chairman, Subcommittee on Toxic Substances
Environmental Oversight, Research and Development
United States Senate
Committee on Environment and Public Works
Washington, DC 20510-6175

Dear Senator Reid:

I have received your letter and the questions regarding my testimony. I am pleased to respond.

1) "Have the conclusions that you have reached as a result of your research been accepted by the rest of the academic and medical community? Would you say that there is a consensus in agreement with your findings?"

There is growing recognition by the medical and scientific community that lead at low dose is neurotoxic. The Environmental Protection Agency in their formal policy statements, and the Agency for Toxic Substances and Disease Registry in its Report to Congress, both state that levels of lead in the range of 10 to 15 μg/dl are unequivocally neurotoxic. While there is not complete unanimity in the medical/scientific community -- and there never will be -- I believe it is fair to say that there is growing convergence on the proposition that extremely small amounts of lead are toxic to the central nervous system, particularly of infants and children.

2) "I understand that the methodology of an earlier study on lead poisoning in children which you conducted was criticized by the EPA. Has your recent study been the subject of peer review by the Science Advisory Board of the EPA?"

continued...

The methodology of my 1979 study on school age children was reviewed by a committee appointed by the Environmental Protection Agency. Their draft report criticized my studies. That report contained 11 errors on the part of the review committee. This draft document was then reviewed by the Clean Air Science Advisory of the EPA. CASAC, the highest level peer review in EPA, felt that their draft report should not be included in the final draft document of the Air Lead Criteria document. Despite this, the lead industry has widely circulated the draft as representing official government policy. This is not true.

3) "It would help the committee if you could rank the sources of lead exposure. What are the first, second, third, fourth, most important sources of lead exposure?"

Unquestionably, the most serious source for children is old paint; second is soil and dust; third is drinking water; and fourth is stationery sources such as primary and secondary smelters.

4) "You have claimed that lead poisoning is the single most significant actual environmental disease affecting our children. As a matter of interest, what is the second most important environmental disease?"

I believe the second most important environmental disease for children is air pollution. This includes ozone, particulates, sulphates, and global warming. The rate of admissions to hospital for asthma are increasing markedly in children in recent times, and I believe this is due to increased air pollutants.

5) "What is the correlation between the level of lead in children's teeth and blood lead levels? Is tooth lead a good predictor of total lead body burden?""

continued...

In my 1979 study, we were able to find records of children who had blood lead tests four years prior to shedding their teeth. We found that the correlation between dentine lead levels and earlier tooth lead levels was quite good. I believe that dentine lead levels are a superior predictor of total body lead burden since they represent bone lead levels and the bones are a sink for lead deposition.

6) "Are the risks to which children are exposed today similar to those present in the 1970's?"

Blood lead levels in this country are lower than they were in the 1970's. This is due to the removal of lead from gasoline. This is one of the real public health triumphs of the past two decades. It also was one of the hardest fought battles that I have ever observed or participated in. Dr. Vernon Houk is justifiably proud of his role in this triumph, as should be the Natural Resources Defense Council, the Environmental Defense Fund, and the Science Advisory Board of the Environmental Protection Agency. At the same time, on the basis of better science, we now realize that even lower levels of lead are toxic. There is still work to be done.

7) "One of the most frequent criticisms of studies of lead in children is the chance that other possible causes for the harm attributed to lead have not been properly controlled for. Can you describe the way in which you controlled for other causes and why you believe your controls were adequate?"

We controlled for other factors which could affect children's development in this manner: When the children and their parents came to the testing laboratory, the mother filled out a lengthy questionnaire which identified and scaled 39 other factors which experience showed are important in development. Among those were: mother's education and occupation, father's education and occupation,

continued...

mother's age at the time of birth, family size, mother's intelligence, and many others. We then compared the distribution of scores on these non-lead factors in the high- and low-lead groups. Those that differed between the high- and low-lead groups were then controlled in the statistical analysis by a procedure called "analysis of covariance." What this does is subtract out the contribution to development from the factors entered into the model.

I believe that this procedure was adequate to control for confounding because the covariates we identified made biologic sense. That is to say, they are well known as factors which influence development, and I cannot find any other factors which we missed. In addition, there is an extraordinary amount of consistency across studies, not just in the United States but in the United Kingdom, Europe, New Zealand and Australia. There are also elegant studies of effects of lead at very low dose in non-human primates and in rodents, which parallel in remarkable fashion the findings we reported.

While science compels us to be ready to modify our conclusions on the basis of new data, no new study of high quality has refuted the findings that I and other investigators have demonstrated the relationship between lead at low dose and children's neurobehavioral performance.

8) "What advice do you have for parents to prevent any lead-related problems from occuring in their children?"

On an individual basis, parents can do the following:

1. They can stop their children from eating foreign substances. Children should be informed that they must not eat dirt, paint or plaster -- and stopped.

2. Children's hands should be scrupulously washed before they have contact with food.

continued...

3. Children should have a blood test for lead at their first birthday and every year thereafter until they are past six years of age.

4. No home should be rehabilitated and deleaded except by people who take the appropriate precautions and nobody should be living in the home until the deleading process is complete and a thorough cleanup has been obtained.

9) "What response do you have to Dr. Cole's criticism of your research as presented at the hearing March 8, 1990, in his written and oral statements?"

Dr. Cole's criticisms continue to be biased, tendentious, and to misrepresent the facts. I attach a longer narrative which deals in greater depth with the status of the draft report that he cited to criticize my work, and a response from Dr. Lester Grant, Chairman of the Criteria Document office of EPA.

I am very grateful for the opportunity of testifying before your committee, and also for the chance to make these additional comments. Please feel free to contact me if I can be of any further use to the committee in its efforts to protect the environment and children's health.

Sincerely,

Herbert L Needleman

Herbert L. Needleman, M.D.
Professor of Psychiatry and Pediatrics

:md
Attachments

RECEIVED MAY 1 6 1986

Attachment for Senator Reid

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Environmental Criteria and Assessment Office (MD-52)
Research Triangle Park, North Carolina 27711

May 15, 1986

Dr. Herbert L. Needleman
Associate Professor of Psychiatry and
Pediatrics, University of Pittsburgh
Children's Hospital of Pittsburgh
School of Medicine
125 DeSoto Street
Pittsburgh, PA 15213

Dear Dr. Needleman:

This letter is in response to your recent phone call regarding the continuing citation by some parties of the November, 1983 report of the Committee on Human Neurobehavioral Evaluations, which appeared as Appendix 12-C in the First External Review Draft of the EPA document Air Quality Criteria for Lead (EPA-600/8-83-028A), but which has been deleted from subsequent drafts of that document.

It is unfortunate that the parties concerned apparently choose to allude to the 1983 Neurobehavioral Committee Report out of context and to ignore later developments that occurred after that initial report. Those later developments, of course, include the following widely known facts:

(1) Reanalyses have been carried out by you and your colleagues in response to criticisms and recommendations contained in the subject Neurobehavioral Committee Report and the results of the reanalyses confirm your earlier published findings on significant associations between pediatric lead exposures and decreased IQ. Similar results were found by reanalyses of the original data set carried out by EPA's Office of Policy, Planning and Evaluation.

(2) All those reanalyses were made available for public review by the Clean Air Scientific Advisory Committee of EPA's Science Advisory Board, which judged that they adequately resolved issues raised by the Neurobehavioral Committee Report.

(3) The Clean Air Scientific Advisory Committee (CASAC) which reached that judgement included a senior member of the Neurobehavioral Committee that authored the original 1983 Neurobehavioral Committee Report.

(4) Pertinent text in the EPA Lead Criteria Document (which is now being put into final form for publication) has been revised accordingly to clearly denote that the reanalyses confirm your earlier published findings on significant associations between elevated dentine lead levels in children and decrements in IQ.

(5) Other prospective epidemiology studies published more recently by you and your colleagues are also discussed in the final version of the EPA Lead Criteria Document as providing evidence for prenatal or early postnatal lead exposure effects on neonatal development, as also reviewed and concurred on by CASAC.

We hope that the above statements adequately clarify the current status of EPA's assessment of your published work on the effects of early lead exposure on pediatric neurobehavioral development.

Sincerely yours,

Lester D. Grant

Lester D. Grant, Ph.D.
Director, Environmental Criteria
and Assessment Office

Copy for Senator Harry Ried

University of Pittsburgh
WESTERN PSYCHIATRIC INSTITUTE AND CLINIC

March 16, 1990

The Honorable Joseph I. Lieberman
United States Senate
502 Senate Hart Building
Washington, D.C. 20510

Dear Senator Lieberman:

I have read the testimony of Dr. Jerome Cole before the Subcommittee on Toxic Substances, Environmental Oversight, Research and Development, Senate Committee on Environment and Public Works, on March 8 1990, that your office has sent to me. I am pleased to respond to your requests for comments on its content and validity.

In my testimony before the same committee, I cited the systematic attempts of the lead industry to obscure the true health costs of lead exposure as one of the principle reasons for the slow pace of preventive efforts in the U.S. Dr. Cole's testimony presents the clearest possible evidence in support of my assertion.

In his statement, he begins with a biased assessment of the five recent studies of lead exposure conducted from birth onward, and argues that the dissimilarity among conclusions indicates that there is no effect of lead, or that the effect is so small as to be trivial. Cole states:

> What these studies are saying is that if there is an effect at low blood lead levels, that effect is very small and it is not at all clear that there is any effect at all. The only way one can reach any other conclusion is to discount those studies which show no effect and to say that any measured effect -- no matter what it is, when it occurs or how inconsistent it is, demonstrates an adverse lead effect.

He presents two tables in evidence. Certain important facts are omitted. Dr Cole neglects to mention that the two studies in his tables that report no effect of

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lead at low dose, the Cleveland study under the direction of Claire Ernhart, and the Sydney study initially directed by William McBride, now by Cooney, were both supported with funds from ILZRO. I believe it is both appropriate and scientifically sound to identify and discount ILZRO-funded studies. My review of the scientific literature has failed to uncover any study of lead at low dose supported by ILZRO that reported an association with health effects. To the contrary, there are a number of ILZRO-funded investigations that attempted to prove that lead was an essential trace metal.

Dr Coles' treatment of the Ernhart study is interesting but incomplete. He neglects to mention that Ernhart's sample was drawn from mothers who were alcohol abusers. Half of her subjects were selected because of self reported use of excessive amounts of alcohol during pregnancy. In her analysis, no mention is made of this, and no effort to control for alcohol is reported. Nor does Cole report that there were some positive lead findings, and these are summarized in the Supplement to the 1986 EPA Air Quality Criteria for Lead-Vol I Addendum (EPA/600/8-89/049A. CASAC review Draft March 89). EPA's statement reads:

> As noted in the 1986 Addendum (U.S. EPA, 1986b) the prospective study by Ernhart and her colleagues has provided some direct as well as indirect evidence of an effect of prenatal lead on neurobehavioral development. Ernhart et al (1985a, 1986) reported significant associations between cord blood lead levels and measures of Abnormal Reflexes... and Neurological Soft Signs... Also the G-R Muscle Tonus measure was significantly related to maternal blood lead levels at delivery.... A brief report on later outcomes in this same cohort mentioned a significant association between G-R Neurological Soft Signs scale and 12 month MDI...although Ernhart et al did not conclude that such an association exists.

The Sydney study was compromised by other problems. Among them was the self-reported "concern over the possible contamination of some of the early capillary blood samples." In addition, major administrative issues may have compromised the study. Dr. McBride, the original Principal Investigator was replaced in 1988 by Dr. Cooney when he (McBride) lost his medical license and position as head of Foundation 41 because of scientific fraud in studies evaluating the antinausea drug Debendox. Dr. McBride had previously reported a no lead effect study in the Med J Australia (1982). He was censured by the journal for a press conference in which he stated that 'removing petrol lead was futile.' [See enclosure]

Dr. Cole then turns to my work, and cites the report of an Expert Committee on Pediatric Neurobehavioral Evaluations. This is not the first time that Cole and the lead industry have cited this authority. Each time they do, they neglect to copy the cover page of the Air Lead Criteria Document, that contains the following statement:

> Review Draft
> (Do Not
> Cite or Quote)
>
> NOTICE
>
> **This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.**

When I received the first draft of this committee, I found 11 important errors, I communicated them to Dr. Lester Grant, head of the Criteria office. I was then asked to review the "Expert Committee" report before the Clean Air Science advisory Committee (CASAC), the highest level of peer review in EPA. After my presentation, CASAC instructed EPA **not to include** the "Expert Committee" report in the Final Draft Document. Thus the Appendix 12-c submitted by Dr. Cole is a draft that has been eliminated from EPA's text. It has no status. Despite having this called to his attention repeatedly, Cole perseverates in distributing this seven-year-old draft and representing it as having official status. ILZRO hired a public relations firm to send both it and a covering letter to science writers and others around the world. When the final draft of the Criteria Document was released in 1986 (EPA/600/8/028df June 1986), the opinion of EPA was stated as follows:

> The Needleman et al (1979) study and spin-off analyses published later by Needleman and coworkers were critically evaluated by the same Expert Committee ...that was convened by EPA in March, 1983, to evaluate the Perino and Ernhart (1974) and Ernhart et al. (1981) studies. The Committee's report (Expert Committee, 1983) noted methodological problems with certain of the published analyses and findings reported by Needleman et al. (1979) ... The Committee also recommended that the Needleman data set be reanalyzed. Reanalyses carried out in response to the Committee's recommendations have been reported by Needleman (1984) , Needleman et al. (1985, and EPA's Office of Policy Analysis (1984) as confirming the published findings on significant associations between elevated dentine lead levels and decrements in IQ, after correcting errors in data calculations detected in earlier published analyses and using alternate model specifications that incorporated better control for potentially confounding factors.

In other words, the lead industry continues to rely on a seven year old draft that EPA's CASAC has discarded, and ignores the official published version in the final Draft Document(1986). When I became aware of this practice, I wrote to Dr. Lester Grant. Head of EPA's Criteria Office. I enclose a copy of his response. In it he states:

> It is unfortunate that the parties concerned apparently choose to allude to the 1983 Neurobehavioral Committee Report out of context and to ignore later developments that occurred

after the original report. These later developments, of course, include the following well known facts:

> ...(4) Pertinent text in the EPA Lead Criteria Document ...has been reviewed accordingly to clearly denote the reanalyses confirm your earlier published findings on significant associations between elevated dentine lead levels and decrements in IQ.

My studies of lead, now exceeding twenty years duration, have caused me often to ponder why, in the face of a huge body of data from human, animal and environmental studies, preventive action has been hesitant and often stumbling. In Dr. Cole's testimony, and in this letter, one reason for the delay can be seen with clarity: the willingness of representatives of the lead industry to obscure the powerful and vital relationship between lead and children's deficits, their habitual use of inferior design in industry-sponsored studies, their selective quotation, and eagerness to suppress any data or conclusions that document the case against lead at low dose.

I thought that the hearings were extremely valuable, and am grateful for the opportunity to participate.

Sincerely,

Herbert L. Needleman, M.D.
Professor of Psychiatry and Pediatrics

:md
Encl.

Copy for Senator Harry Reid

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333

FOR RELEASE ONLY UPON DELIVERY

LEAD POISONING PREVENTION PROGRAM

Testimony by
Vernon N. Houk, M.D.
Assistant Surgeon General
Centers for Disease Control
Public Health Service

Before the
Subcommittee on Toxic Substances,
Environmental Oversight, Research
and Development

Committee on Environment and
Public Works
U.S. Senate

March 8, 1990

Good morning, Mr. Chairman. I am Dr. Vernon N. Houk, Director, Center for Environmental Health and Injury Control (CEHIC), Centers for Disease Control (CDC), and I am pleased to testify on behalf of the Department of Health and Human Services (HHS) on the subject of childhood lead poisoning prevention.

In July 1988, in response to a Congressional mandate, the Department of Health and Human Services delivered to Congress a report prepared by the Agency for Toxic Substances and Disease Registry (ATSDR) on the nature and extent of childhood lead poisoning in the United States. That report contains many important findings upon which much of what we are discussing here is based. Dr. Barry Johnson, Assistant Administrator, ATSDR, is here with me today to answer questions the subcommittee may have about the report.

Lead poisoning remains the most common environmental disease of young children; it is also the most societally devastating. But most importantly, it is entirely preventable. Today in the United States, millions of children from all geographic areas and socioeconomic strata have blood lead levels high enough to cause adverse health effects. Poor minority children in the inner cities, who are already disadvantaged by poor nutrition and other factors, are particularly vulnerable to this disease. Lead poisoning is also an important concern in work-related exposure situations such as (1) exposure of workers to lead in industrial and construction occupations (which could also include fetal exposure); (2) lead exposure of workers' families when workers return to their homes with lead contamination; (3) exposure of workers to lead while conducting lead abatement activities including lead-based paint abatement in housing and buildings.

Lead is a toxin that affects every system in the body. It is particularly harmful to the developing brain and nervous system, so that lead exposure is especially devastating to the fetus and young children. Very severe lead exposure can cause coma, convulsions, and even death. Lower levels of lead, which usually do not cause symptoms, result in decreased intelligence, decreased ability to learn, developmental disabilities, behavioral disturbances, and disorders of blood production. Many of the most serious effects of lead are irreversible; children who have moderate lead levels when they are very young have markedly increased school dropout rates, decreased ability to learn, difficulties with reading, and neuro-behavioral abnormalities. Most screening programs reach only a small fraction of the children at risk; the majority of children whose intelligence and development are being affected by lead are never identified.

Childhood lead poisoning from housing was first described in the 1890's in Australia. The severe health and developmental effects of lead poisoning were not recognized in this country until the 1940's. At that time, it was thought that blood lead levels of 80 micrograms per deciliter (ug/dl) or greater were cause for concern; by the 1960's, we began to be concerned about 60 ug/dl or greater; in the 1970's, it was 40 ug/dl or greater; and by the middle 1980's, 25 ug/dl or greater.

Very recently, research funded by the National Institute for Environmental Health Sciences has conclusively shown that adverse behavioral effects on the fetus and the child begin with blood lead levels of 10-15 ug/dl; they may even be present at lower levels. If there is a threshold below which there are no adverse effects of lead on the young, it is near zero.

Lead poisoning is an entirely preventable disease. At present the major high-dose source of lead is from leaded paint, both from the paint itself and its contribution to dust and soil. Most lead has been voluntarily removed from food; essentially no lead is being added to gasoline. Old leaded batteries are being safely collected and recycled, and new paint contains essentially no lead. There are other sources that relate to specific groups of individuals individuals, such as workers, bobbyists, and users of lead-containing ceramic utensils. One of the challenges of removing existing lead from the environment is to do so without harm to the workers engaged in its removal and to dispose of the removed lead safely.

Federal regulatory actions and voluntary efforts have significantly reduced or eliminated new lead from being added to many consumer products, including paint, food, and gasoline. Unfortunately, we have made little progress in eliminating leaded paint from the older houses. These older, lead-painted homes are now the major source of high-dose lead poisoning. Children ingest this lead not only from paint and dust, but from outside soil and dust contaminated by the leaded paint. Young children ingest most lead from doing precisely what children are supposed to do. There is considerable hand-to-mouth activity in the child's exploring his or her environment. In addition, fetal exposures to lead occur through exposure of pregnant women working in lead-contaminated industrial and construction environments. Until we eliminate the environmental sources of lead, we will continue to have a significant childhood lead poisoning problem and the health of generations of our children will continue to be adversely affected.

From 1973 through 1981, CDC administered a categorical grant program to fund childhood lead screening and follow-up activities in State and local health departments. In these years, more than 100 communities in 40 States received financial assistance for lead poisoning prevention activities. Over $89 million were distributed, and a quarter of a million children with elevated blood lead levels were identified and received referrals for medical and environmental intervention. Financial resources for environmental abatement activities in other agencies were extremely limited.

In 1981, as a result of Congressional activities, this categorical grant program was transferred into the Maternal and Child Health Services Block Grants administered through the Health Resources Services Administration. Under the Block Grant program, each State sets its own priorities for use of these funds. Because of limited block grant reporting requirements at the time, we do not have good data on what States have been doing in the area of lead poisoning prevention. However, the information we do have indicates mixed impacts; several States and cities significantly increased the number of children screened under the block grant, while others decreased their levels of lead screening program support. We do not have information whether the children screened are at the highest risk.

In 1988, Congress passed the Lead Contamination Control Act (Publ L. 100-572). Section 3 of this Act authorized a new categorical Federal lead poisoning prevention program to be administered by CDC. The new law authorizes CDC to fund State and local health agencies for childhood lead screening, referral of children with elevated levels for treatment and environmental intervention, and education about childhood lead poisoning. The first appropriation under this authority is this current fiscal year's $4 million.

In response to this Congressional mandate to reestablish a childhood lead poisoning prevention program, CDC has continued or begun a number of activities, which I will now discuss briefly.

- Lead Poisoning Prevention Grant Program - With the $4 million appropriation for FY 1990, CDC will support comprehensive screening and follow-up programs in three to six States, counties, or cities with a demonstrated severe childhood lead poisoning problem. This grant program is an important first step in identifying children at high risk for lead poisoning. We expect to publish in April a Federal Register notice on the availability of funds. In the meantime, we have been meeting with State and local agencies and others to provide consultation on childhood lead poisoning prevention. We will continue to provide technical assistance to both funded and nonfunded programs once the grants are awarded.

- Strategic Plan for the Elimination of Childhood Lead Poisoning - We are developing a plan for the elimination of childhood lead poisoning during the next 20 years. In both the development and implementation of the plan we will work with other Federal agencies, State and local governments, and the private sector. The plan will examine the costs and benefits of abating lead-contaminated homes and make recommendations for the steps that must be taken to eliminate lead poisoning.

- CDC Lead Statement - Recent well-conducted prospective studies have shown adverse effects on children's health at blood lead levels previously thought to be safe. We are convening an advisory committee to update the 1985 statement, Preventing Lead Poisoning in Young Children, to take into account these new data. This statement will provide guidelines for screening children for lead poisoning and follow-up of children with elevated lead levels for pediatricians and screening programs. Emphasis is placed on lead abatement and prevention.

- Proficiency Testing Program - In collaboration with the Health Resources and Services Administration and the University of Wisconsin, CDC will administer a Blood Lead and Erythrocyte Protoporphyrin (EP) Proficiency Testing Program. Through this program, participating laboratories evaluate on a monthly basis how well they can measure lead and EP levels. Laboratories that perform poorly receive technical assistance. Several hundred laboratories from 30 States participate in the program on a routine basis. New laboratory evaluation techniques are being developed to accurately measure blood lead at the lower levels.

- Epidemiologic Studies - We are evaluating data from screening programs and other sources that will help to improve childhood lead screening efficiency. For example, we are working with the city of Chicago to analyze data about the sensitivity and specificity of the currently-used screening test for lead poisoning. We are also helping Louisville, Kentucky, evaluate a screening form for determining which housing is most likely to poison children. Several essential studies that we plan to conduct include evaluations of ways to improve efficacy of screening and further examination of the relative contributions of different lead sources for children's blood lead levels.

- National Surveillance - The only data currently available for estimating how many children have elevated blood lead levels derive from national surveys of nutritional and health status that are conducted by the National Center for Health Statistics about once a decade. These data, while extremely valuable, can only be used to monitor long-term trends. They cannot be used to characterize small geographic distributions of the disease, clusters in time or space, or the relative importance of various environmental sources of lead on a population basis—information that is essential to any national effort to eliminate the disease. To address such information needs, we are working with the Association of State and Territorial Laboratory Directors, and State epidemiologists to develop an ongoing laboratory-based surveillance for elevated lead levels.

- CDC's National Institute for Occupational Safety and Health (NIOSH), is working with the Department of Housing and Urban Development to define risks to workers who abate lead contaminated environments, recommend safe work practices and assist in the development of guidelines for workers involved in testing and abatement, and develop a curriculum for training abatement workers.

- When requested by employer or employee representatives, NIOSH will continue to perform health hazard evaluations to evaluate potentially hazardous lead exposures in occupational environments and recommend measures to eliminate such exposures.

- We are continuing to work with the Environmental Protection Agency, the Department of Housing and Urban Development, State and local agencies, the American Public Health Association, the American Academy of Pediatrics, the media, parent groups, and others in the private sector to develop a concerted effort to eliminate this entirely preventable disease.

These activities being conducted by CDC are an important step towards ensuring that children are not being adversely affected by lead. However, after nearly two decades of effort we know that without lead abatement, mass screening and public education--while important--are not enough to eliminate this disease. The key to eliminating childhood lead poisoning is to prevent the exposures that cause it. For most poisoned children, this means removing lead-based paint. The greatest impediment to preventing this disease is the high cost of removing lead-contaminated paint in older housing and paint-contaminated dust and soil around this older housing. We will continue to work with other Federal agencies, State and local governments, and the private sector to address this important issue.

This concludes my testimony. Thank you for this opportunity. I will be happy to answer any questions.

STATEMENT

by

KATHRYN MAHAFFEY, Ph.D.

Research Chemist

National Institute of Environmental Health Sciences

National Institutes of Health

before the

U.S. Senate

Committee on Environment and Public Works

Subcommittee on Toxic Substances, Environmental Oversight,
Research and Development

March 8, 1990

March 8, 1990

Mr. Chairman. My name is Kathryn R. Mahaffey; I am a research chemist for the National Institute of Environmental Health Sciences of the National Institutes of Health. The NIEHS has long been concerned about the health effects of lead exposures, especially for infants and young children. NIEHS has maintained a very active research program to investigate lead effects on child development. During FY 1989, NIEHS funding of approximately $7 million supported 34 research grants and Center grants that had a component on lead research. We have continued to support research on the human health effects of exposure to low-levels of lead during a period when many believed that additional study would not yield much important information. These NIEHS longitudinal studies have yielded findings of considerable importance to public and environmental health.

Exposure to high concentrations of lead produces neurological damage and, if untreated, can result in profound damage to the central nervous system and/or death. Over the last decade, lead exposures decreased as alkyl lead additives to gasoline were phased down, and lead used to solder food and beverage cans was markedly reduced. Although lead exposures have declined, lead-associated impairment of child development has been identified at lead exposures much lower than previously recognized as harmful.

During the 1960s and 1970s, learning disabilities associated with blood lead concentrations in the range of 30 to 50 micrograms/deciliter (ug/dl) of whole blood were reported. However, child development is a complicated process. To better understand how lead affects this process, longitudinal studies, sponsored by NIEHS, began in the early 1980s. In a longitudinal study a child is repeatedly evaluated at a number of different ages to better describe the child's developmental profile.

Two of the NIEHS sponsored longitudinal studies are being conducted in Cincinnati and Boston. The Cincinnati study evaluated a group of inner-city children from low socio-economic status families. The Boston study was of children from upper-income, professional families. Both groups of children showed the adverse effects of lead despite very different patterns of lead exposure and socio-economic status.

In the Boston study, infants with umbilical cord blood lead concentrations of 10 - 25 ug/dl showed a 4 - 8 point decrease in performance IQ between 6 and 24 months relative to infants with a blood lead concentration below 3 ug/dl (Bellinger et al., 1987b). In the Cincinnati cohort, developmental scores at 3 and 6 months were 6 to 7 points lower for each 10 ug/dl increase in prenatal blood lead levels (Dietrich et al., 1987).

These effects occurred at far lower blood lead concentrations than expected. These concentrations were typical of the urban population only a decade ago. To help put lead exposures into perspective, it is useful to remember that blood lead concentrations of approximately 150 ug/dl in a young child, unless the child is hospitalized and appropriately treated, can be fatal. In the 1960s, we knew so little about lead effects that blood lead concentrations recommended as a level of concern for children (e.g., 60 ug/dl until approximately 1970) were 40 percent of a dose that can be lethal to young children. Current concentrations recommended for environmental intervention (10 ug/dl; EPA, 1989) are approximately 7 percent of the lethal dose.

HOW COMMON ARE ELEVATED LEAD EXPOSURES?

Elevated lead exposures are common among children living in highly urbanized areas. There are an estimated 2,380,600 children, ages 6 months through 5 years, who have blood lead concentrations >15 ug/dl. This is 17.2 percent of the 1984 population of 13,840,000 children ages 6 months through 5 years living in urban areas. The following table has been adapted from the ATSDR Report to Congress (page V-14, 1988).

Characteristic	Population Base	Blood Lead Level > 15 ug/dl
In SMSAs>1,000,000	7,251,000	1,493,400
In Central City	2,886,200	901,800
Not in Central City	4,364,800	591,600
In SMSAs <1,000,000	3,536,400	483,000
In Central City	1,504,800	301,100
Not in Central City	2,031,600	181,900
In small SMSAs*	3,052,600	404,200
National Total	13,840,000	2,380,600

* Defined as under 1,000,000 but data differentiating central city and not central city not available.

Exposure to lead is very much an urban problem. This can be seen from some data provided by Dr. Kim Dietrich and Dr. Robert Bornschein of the University of Cincinnati Medical Center. Among a group of 250 inner-city, low socio-economic status children 22 percent had blood lead concentrations > 25 ug/dl by the age of 27 months. More than three times as many, 75 percent, had blood lead concentrations greater than 15 ug/dl by age 27 months.

These and other data support lead exposure as a severe public health problem. This is only the tip of the iceberg because many children are much less well-cared for than are the children in the Boston/Cincinnati studies. Numerous problems - teen-age mothers, single parent situations, drugs, inadequate money to meet minimal needs, mothers over-stressed with responsibilities- can only intensify the adverse effects of lead exposure on child development. Research is urgently needed on how to interrupt the transfer of lead from the environment to the child.

PRENATAL LEAD EXPOSURES

This problem of lead exposure is especially troublesome during pregnancy. Very little lead is needed to adversely affect the fetus during gestation (Mahaffey, 1990). Lead easily crosses the placenta. The blood lead concentration of the infant is about 90 percent of the maternal blood lead concentration. Lead accumulates in the fetal brain and bone. Blood lead concentrations of 10-15 ug/dl have been associated with adverse and lasting effects on the child's neurological development (EPA, 1989).

The following table is derived from the ATSDR Report to Congress (Table I-6 of that report, page I-22). The number of women having blood lead concentrations above 10 ug/dl is estimated to be approximately 4.5 million. This means that each year about 400,000 infants are born with blood lead concentrations over 10 ug/dl.

Estimated numbers of women of childbearing age and estimated number of pregnant women and projected numbers, above two selected Blood lead criterion values (ug/dl), by race and age, in all SMSAs, 1984.

Race/Age (years)		Base Population	Blood lead (ug/dl) >10	>15
Women in SMSAs				
White	15-19	5,478,000	504,000	27,400
	20-44	29,740,000	2,884,800	535,300
Black	15-19	1,098,000	90,000	14,300
	20-24	4,984,000	981,800	184,400
TOTAL		41,300,000	4,460,600	761,400
Pregnant Women in SMSAs				
White	15-19	433,000	39,800	2,200
	20-44	2,380,000	230,900	42,800
Black	15-19	187,000	15,300	2,400
	20-44	595,000	117,200	22,000
TOTAL			3,595,000403,200	69,400

Lead that is transferred to the fetus can come from the current environment (for example, air, food and water). In addition, lead stores from maternal bone can serve as a source of lead. A current research question concerns what proportion of lead transferred to the fetus comes from current environmental exposures and what comes from the maternal stores of prior lead exposures, that is, from the mother's bones.

The NIEHS is currently investigating lead transfer from mother to the infant in utero. The first study investigates a group of women living in South Australia near very large lead smelters. The second study is being conducted in animals that have had controlled lead exposures since early infancy. These studies permit us to determine whether current lead exposures (food, water, air) or past-exposures (coming from lead stored in bone) dominate in lead transferred to the fetus.

We anticipate that bone lead stores will be a major determinant of lead transfer to the fetus. The main reason for bone resorption in pregnancy is to provide calcium to the developing fetus. If funding permits, we plan to investigate whether or not additions to dietary calcium can decrease mobilization of lead and calcium from the bone stores during pregnancy.

We already know from studies in Boston and Cincinnati that the prenatal lead exposures can influence child development beyond the first year of life. In the Boston study, children who had high prenatal lead exposures and high concurrent exposures at approximately 5 years (blood lead level > 10 ug/dl) did less well on intelligence testing (McCarthy Tests of Mental Development) than did children with high prenatal exposure, but lower concurrent exposures (Bellinger et al., in press). In the Cincinnati children, prenatal blood lead concentration was associated with the child's performance on a test of language function (Dietrich, 1990). The probability of a 3-year old child's passing a series of preschool tests of speech and language development decreased significantly as the prenatal blood lead concentration increased. The probability of passing all of a series of 4 age-appropriate tests of speech and language function was about 65 percent when the prenatal blood lead concentration was under 2 ug/dl, but dropped to about 10 percent when the mother's prenatal blood lead concentration was in the range of 15-25 ug/dl. The same group of children are also showing impaired growth rates and difficulties with balance control at 5 and 6 years of age.

These data, along with the findings of several other studies, indicate that the adverse effects of lead begin during gestation. The data described by Dr. Needleman showing that exposure to lead in childhood is associated with deficits in central nervous system functioning that persist into young adulthood (Needleman et al., 1990) are also important. Because of the profound societal significance of such findings it will be important to confirm these in longitudinal studies populations like those of the Cincinnati and Boston studies. Because the Cincinnati and Boston studies are of low and high socioeconomic groups, respectively, it would be a very valuable research opportunity to be able to follow these children and find out if these effects of lead seen in childhood and adolescence continue into later years.

I would be pleased to answer any questions.

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Testimony of
Dr. Robert L. Bornschein
Department of Environmental Health
University of Cincinnati
before
The Subcommittee on Toxic Substances,
Environmental Oversight, Research and Development

My name is Dr. Robert Bornschein, I am Associate Professor of Environmental Health and Director of Environmental Epidemiology at the University of Cincinnati School of Medicine. I am co-directing (along with Drs. Clark, Dietrich and Hammond) two large, federally funded research projects investigating childhood lead exposure. The first of these projects, now in its eleventh year, is a study of about 300 children born in inner-city Cincinnati between 1980 and 1985. This study is funded by the National Institute of Environmental Health Sciences. The purpose of the study is to identify pathways by which children become exposed to lead, and to study the developmental consequences of prenatal and early childhood lead exposure. This study includes repeated measurements of lead in and around the children's homes, with particular emphasis on lead in paint, soil, exterior surface dust and interior house dust. The 300 children in our study are largely from low income minority families. They move frequently, having occupied over 1500 apartments since the beginning of the study. These dwellings are primarily 19th century buildings in various states of repair, ranging from full rehabilitation to extensive deterioration. Seventy-two percent of these buildings still contain lead paint, with 28% of the homes having very dangerous amounts of lead in paint (> 6.0 mg lead/cm^2 surface area). The surface soil around these buildings is also badly contaminated with lead from paint which has weathered, chalked, chipped or peeled away, and fallen to the ground. Once there, the weathering process continues until the paint chips are converted into a fine dust. The average amount of lead in surface soil or dust around these homes is over 5000 ppm. Soil uncontaminated by paint, auto emissions and industrial emissions contains less than 20 ppm (20 ppm versus 5000 ppm; a 250-fold increase).

This contaminated surface soil and exterior dust serves as a large reservoir of lead which continually blows around neighborhoods, is tracked indoors on shoes, carried in by house pets, and blows through open doors and windows. Once inside, now in the form of lead contaminated house dust, it poses an immediate threat to infants and toddlers who crawl on the floor, get the lead contaminated dust on their hands and then put their hands or lead-contaminated toys in their mouth. Unknowingly, and unrecognized by the parents, they are ingesting poison.

Our study, as well as many others, have shown a clear relationship between the average amount of lead in soil and the average amount of lead in blood of children living in the area. There is a 2-4 ug/dl increase in blood lead levels for every 1000 ppm increase in soil lead above 500 ppm. Children reared in these homes experience a quadrupling of their blood lead level in the first year of life, from about 4 ug/dl at birth to about 18 ug/dl at 1 year of age (see attached figure). Even children living in lead paint abated housing have higher than expected blood lead levels due to the presence of lead in soil and street dust in the neighborhood.

This migration of lead from exterior paint to exterior surface soil and dust, to interior house dust, and then to lead dust on hands and toys must be recognized and understood if intervention and abatement efforts are to be successful. Lead based paint is the source of greatest concern in our older homes. However lead in dust is the form in which it migrates and poses a risk to the greatest number of children. The full benefits of abating lead paint will not be realized if lead contaminated soil and dust remain to re-contaminate the lead paint abated apartment. We have direct experience with this problem in Cincinnati. In the late 1960's over 6500 dwelling units were fully rehabilitated to provide low income housing. The interiors were gutted and reconstructed, with the result being that all woodwork and lead paint were removed thus creating lead free interiors. Unfortunately, the rehab process also included sandblasting of exterior brick surfaces to remove old paint. This lead paint remains today in the form of heavily lead contaminated soil that surrounds each of the rehab dwellings. Levels of lead in the house dust of these lead-paint-free homes are twice as high as found in new urban housing. Children growing up in these homes have levels of lead in their blood which are 50% higher than their peers (15 ug/dl versus 10 ug/dl). These children are not at risk of acute, overt lead poisoning, which can result from the direct ingestion of lead paint chips, but they are at risk of incurring a more subtle yet serious impairment of growth and cognitive development.

I'd like now to turn your attention to the second research project which we are conducting in Cincinnati. This study is one of three soil lead abatement demonstration projects funded by the Superfund Amendment and Re-Authorization

Act. These studies are intended to investigate the effectiveness of neighborhood soil abatement on reducing children's blood lead levels in the community. We are also examining the additional benefits to be gained by removing lead contaminated house dust, as well as studying rates and sources of recontamination following soil and/or dust lead abatement. At the present time the study is approximately 40% complete with about 110 properties abated in the fall of 1989. Full study results from all three cities, ie Cincinnati, Baltimore and Boston, should be available in mid 1991. At the present time we have found that carpets and fabric upholstery in these homes are heavily contaminated with lead dust. This reservoir of lead is extremely difficult to remove. If left unabated it will remain as a continuing source of lead exposure and attenuate the expected benefits from lead paint and soil abatement. We are currently exploring a number of abatement techniques to find the most cost effective methods for abating lead in urban dust and soil.

I would like to close by drawing your attention to a subtle but important distinction between characteristics of lead found in urban soils and that found around mining and milling sites, many of which are currently on the National Priority List of Superfund sites. Lead in urban soils arise from paint, automotive and industrial emissions. It exists in the form of very small particles which readily adhere to children's hands and are readily dissolved and absorbed into the body. On the other hand, lead found around old mining and milling sites is of geologic origin, it is usually found in larger particles than that seen in urban particulates and the lead is in the form of lead sulfide usually imbedded in quartz. Such particles are much less likely to be inadvertently ingested and absorbed into the blood stream. Our studies at such sites have found children's blood lead levels to be well below levels predicted simply on the basis of soil lead levels. The risks arising solely from exposure to lead of geologic origin appears to be substantially less than that associated with the urban lead exposure situation. While more research is needed to understand how particle size and chemical species influences risk, there is no doubt that current levels of lead in urban soil and dust are resulting in the unnecessary exposure of millions of children.

In closing, lead paint and soil contaminated by lead paint and fall out from leaded gasoline, have been clearly identified as the major sources of lead exposure in our inner cities. The "lead problem" will remain until we find effective means of eliminating these sources.

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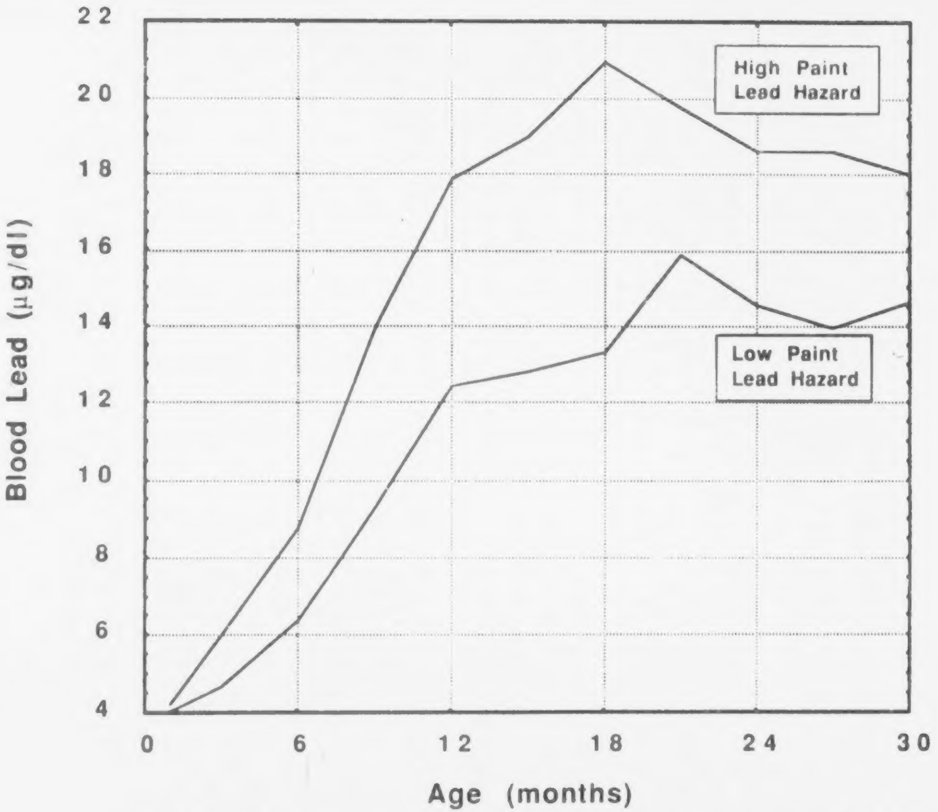

Developmental blood lead profiles for children born and reared in low lead paint hazard (Pb < 1.0 mg/cm^2, N=31 at 18 months) or high lead paint hazard (Pb > 6.0 mg/cm^2; N=46 at 18 months) housing. (adopted from Clark, et al 1989).

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TESTIMONY OF
THE ENVIRONMENTAL DEFENSE FUND

before the

SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL
OVERSIGHT, RESEARCH AND DEVELOPMENT

of the

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

DR. ELLEN K. SILBERGELD
SENIOR SCIENTIST

accompanied by

KAREN FLORINI
SENIOR ATTORNEY

MARCH 8, 1990

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On behalf of the Environmental Defense Fund, a national nonprofit environmental organization with over 150,000 members in the United States, I am pleased to respond to your invitation to testify before the Subcommittee on the subject of children's exposure to lead. I am Dr. Ellen Silbergeld, a toxicologist with the Environmental Defense Fund. I am also a adjunct professor of health policy at the Johns Hopkins Medical Institutions and an adjunct professor of toxicology and pharmacology and the University of Maryland Medical School. Most of my scientific career has been devoted towards understanding and preventing lead poisoning in children. As a postdoctoral fellow in environmental medicine and neuroscience at Johns Hopkins, I was privileged to work with Dr. Julian Chisolm and to learn firsthand the ravages of lead paint on children in the city of Baltimore. From that position, I went to the National Institutes of Health where for 8 years I conducted research on the mechanisms of lead toxicity on the brain; that research along with the work of many colleagues in biomedical research and epidemiology provided the groundwork for the current consensus opinion on lead as a toxic threat to children's neurological development. In 1982, I took a position with the Environmental Defense Fund, where one of my first tasks was to respond to a proposal by Mrs. Burford's EPA to add lead back into gasoline. I am currently on sabbatical leave from EDF to the University of Maryland Medical School, where I am codirecting a research project to identify and prevent low level lead toxicity in children, pregnant women, and workers.

On Monday March 5, EDF released a report titled, "Legacy of Lead: America's Continuing Epidemic of Childhood Lead Poisoning," a copy of which I am submitting for the record with this testimony. (Copies of the Report have previously been distributed to all Members.) In this document, we review the current state-of-the-art biomedical opinion on the hazards of lead poisoning and the critical need to control the continuing sources of exposure for the millions of children and fetuses affected each year by lead in the environment. Distinguished scientists, physicians, and public health experts will present testimony before this Subcommittee today on these issues. In fact, there is little disagreement among experts as to the nature of lead toxicity as an epidemic in America, and on the causes of that preventable epidemic. We are all grateful for your recognition of the severity of this problem. The Congress has signalled its commitment to join those who at many levels have expressed renewed concern to end lead toxicity. Over the past year, I have heard from persons in the World Health Organization, the Pan American Health Organization, governments in South America and Eastern Europe, federal, state, and local public health agencies, and citizens' groups, all of whom share the common goal of preventing the scourge of lead from continuing its cycle of devastation.

In this testimony, I will attempt to provide answers to three critical issues facing Congress in your attempts to solve the lead epidemic:

* *why is lead poisoning still a problem in the U.S.?*
* *what are the sources of lead for American children?*
* *how can we prevent lead poisoning in the U.S.?*

1. Why is lead toxicity still a problem in the U.S.?

Lead is not a new problem, nor is recognition of its hazards a new discovery in medicine. In the U.S., since the 1920's it has been recognized that the environmental releases of lead -- from industry and through dispersive uses of lead-containing products, including lead-based paint -- result in exposure of children. Since the 1940's, we have had notice from clinical research that the toxic effects of lead are especially serious for your children, and that exposures without apparent effect at the time can cause persistent damage to learning and behavioral development of children. (Citations and further details on these and other points made in this testimony can be found in EDF's Report.)

In the 1970's, America began to respond to this knowledge with partial controls on some uses of lead: from 1970 to 1980, federal and state governments regulated lead in the workplace, lead in gasoline, lead in pesticides, lead in air, and lead in drinking water. Lead based paints were restricted in use. These actions taken together have resulted in slowing the growth of the epidemic by reducing the continuing inputs of lead into the environment.

As a consequence of these actions, the general exposure of the American public to lead has been reduced, as shown dramatically in national survey data collected by the U.S. Public Health Service from 1976 to 1980. Documentation of the connection between vigorous environmental and occupational regulation and disease prevention helped roll back attempts to weaken the phasedown of lead in gasoline and attempt to extend exemptions to many lead industries. Both EPA and OSHA deserve our commendations for their use of scientifically based policy to develop and protect lead regulations. The lead regulations have been cited as outstanding examples of preventive public health policy in the workplace and general environment.

But still we have not ended lead toxicity in America. Why? There are two reasons for this.

(1) Clinical findings on the hazards of lead have caused a significant reevaluation of the need to prevent exposures at lower and lower levels. As Dr. Needleman will discuss, his groundbreaking research (replicated by researchers around the world from 1979 to the present) has demonstrated beyond doubt that lead exposures well below those considered hazardous in the 1970's are in fact dangerous to children's health and development. Moreover, research on the health status of adults exposed to relatively low levels of lead has revealed strong associations between lead exposure and increased blood pressure, and chronic lead exposure and kidney cancer. Both the U.S. EPA and the U.S. Centers for Disease Control consider the association between lead and hypertension, and lead and cancer, urgent reason to reconsider current medical recommendations on preventing lead exposure. As Dr. Houk will testify, the Public Health Service is in the process of reevaluating its advice to physicians. My own research convinces me that lead toxicity is on a continuum such that, over the range of lead exposures that we all inevitably encounter living in a post-industrialized world, there is no threshold or margin of safety left. Compared to preindustrial humans, the lead levels in

our bodies are several hundred times higher; moreover, because of its long persistence in our bodies, very low level intake over a lifetime confers a burden of hazard that may be very great for fetuses, exposed to lead from their mothers' bones, and for the ageing, when bones release decades of stored lead back to the bloodstream.

Thus, while we have taken effective steps to reduce lead exposures overall, these modest actions have not kept pace with increasing knowledge about the hazards of lead. We have been keeping the tiger at bay, but the tiger is overtaking us.

(2) The other reason for the continuing epidemic of lead toxicity is found in our failure to deal effectively with the two classes of major sources of lead in the environment. These two categories are the ongoing manufacture of leaded products and their uses and disposal, and the enormous reservoir of lead resulting from past uses of lead and disposal of lead-containing wastes.

In no instance have we completely banned any use of lead; in too many instances, we have only attempted to regulate end uses rather than intervening at the level of production. Thus, for instance, in 1986 Congress amended the Safe Drinking Water Act to ban the use of lead in solder or plumbing for drinking water systems. However, lead-based solders are still manufactured and sold at wholesale and retail outlets around the country. Indeed, lead solder is more widely available and often cheaper than lead-free solder. In most instances, there is little information available to professional plumbers or consumers on the need for avoiding use of lead solder. Local investigations -- as in Philadelphia -- have documented continued use of lead solder in drinking water plumbing. Similarly, lead-based pesticides have been restricted in use but not banned from production; lead additives to gasoline have been phased down but not banned; lead based paints have been proscribed for household use but not for industrial use. Even that most outrageous source of lead contamination, lead soldered cans, has never been actually regulated: FDA and industry have developed a "voluntary" program in which use of solder has been reduced by industry without much oversight or even mandatory reporting or labelling. And a significant fraction of lead cans -- from 6% by industry figures to over 20% by one independent study of tomato-product cans -- still have lead-soldered seams. Many stationary sources of lead, including all primary lead smelters, operate under variances from EPA and OSHA, so that they release substantial quantities of lead into the environment each year.

Second, and most importantly, we have done virtually nothing about the vast reservoir of lead already dispersed in our environment. This lead remains in our homes, drinking water, playgrounds, and city streets. Of these reservoirs, lead paint is the most proximate public health threat to our children. It is the true legacy of lead. Because lead is an element, it never degrades and its hazard is never diminished. Lead will outlast the longest radionuclide, the most persistent synthetic organic chemical. Human exploitation of lead over the past 5000 years has transferred over 300 million metric tons from beneath the earth's crust to the air, water, and surface soils of the planet. This lead will never go away. Regulation of current uses of lead, even if more vigorous that the current state of activity, will not impact on this enormous source. That is why all the actions taken over the past 20 years have not solved the epidemic of lead poisoning.

Specifically, we have failed to prevent lead toxicity particularly in children. This is because of our failure to deal effectively with the most significant reservoir source of lead for children, lead-based paint in older housing.

2. What are the sources of lead?

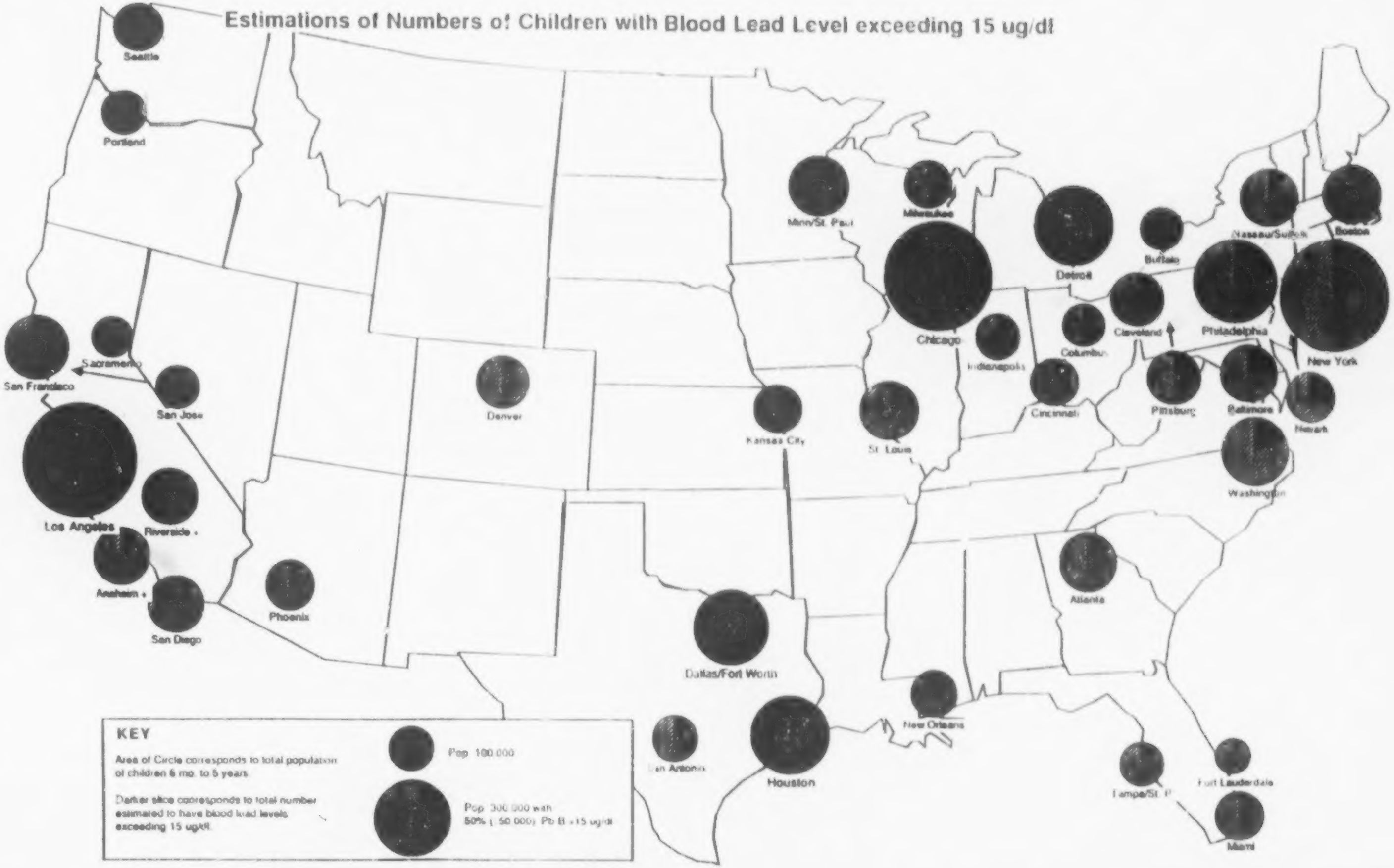
The sources of lead for children are twofold: exposures to lead in leaded products throughout their lifecycles (including releases from production, contact during use, and releases from waste disposal); and exposures to lead in the great environmental reservoirs. Of these, when it is present, lead paint constitutes the most intense source of exposure for many young children. It is important to emphasize the importance of both prevalence and intensity in assessing sources of lead: prevalence relates to the number of persons in contact with specific sources, and intensity relates to the amount of lead that may be transferred to people from specific sources. According to ATSDR, the most prevalent sources of lead for American children are probably lead in drinking water and lead in soils; the most intense sources of lead for children are probably in lead paint and lead in soils.

Ingestion of dusting and chipping lead paint by young children is responsible for hundreds of cases of hospitalization each year. According to directors of lead clinics around the country, these cases represent the tip of the iceberg of thousands or millions of undetected lead poisoned children.

Congress was convinced of the problem in 1971, when it passes the Lead Based Paint Poisoning Prevention Act (LBPPA). This Act recognized the dual nature of lead hazards in the US by mandated control on the ongoing use of lead-based paint and by calling for a health-based program of identifying and removing lead paint hazards before children were poisoned. Unfortunately, the intent of Congress has been repeatedly thwarted and, as a consequence, lead based paint poisoning remains epidemic. The Reagan Administration defunded lead screening programs and the Department of Housing and Urban Development has failed over the past 15 years to develop or implement a program of safe and effective lead paint abatement in its own housing or guidance for abatement programs by others.

In our report we present local estimates on the extent of lead toxicity in US children, as that disease is defined by the emerging consensus of medical opinion. These estimates reflect local variations in age of housing stock, highlighting the role of lead paint in causing this epidemic. The attached maps of our prevalence estimates for selected cities reveal the nationwide scope of this problem. It must be stressed that the figures in our Report are estimates, not measurements; because of the limits of the underlying data, the estimates are not precise. But they clearly illustrate a disease of epidemic scope, and a public health crisis that demands prompt action.

Estimations of Numbers of Children with Blood Lead Level exceeding 15 ug/dl


Seattle
Portland
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Minn/St. Paul
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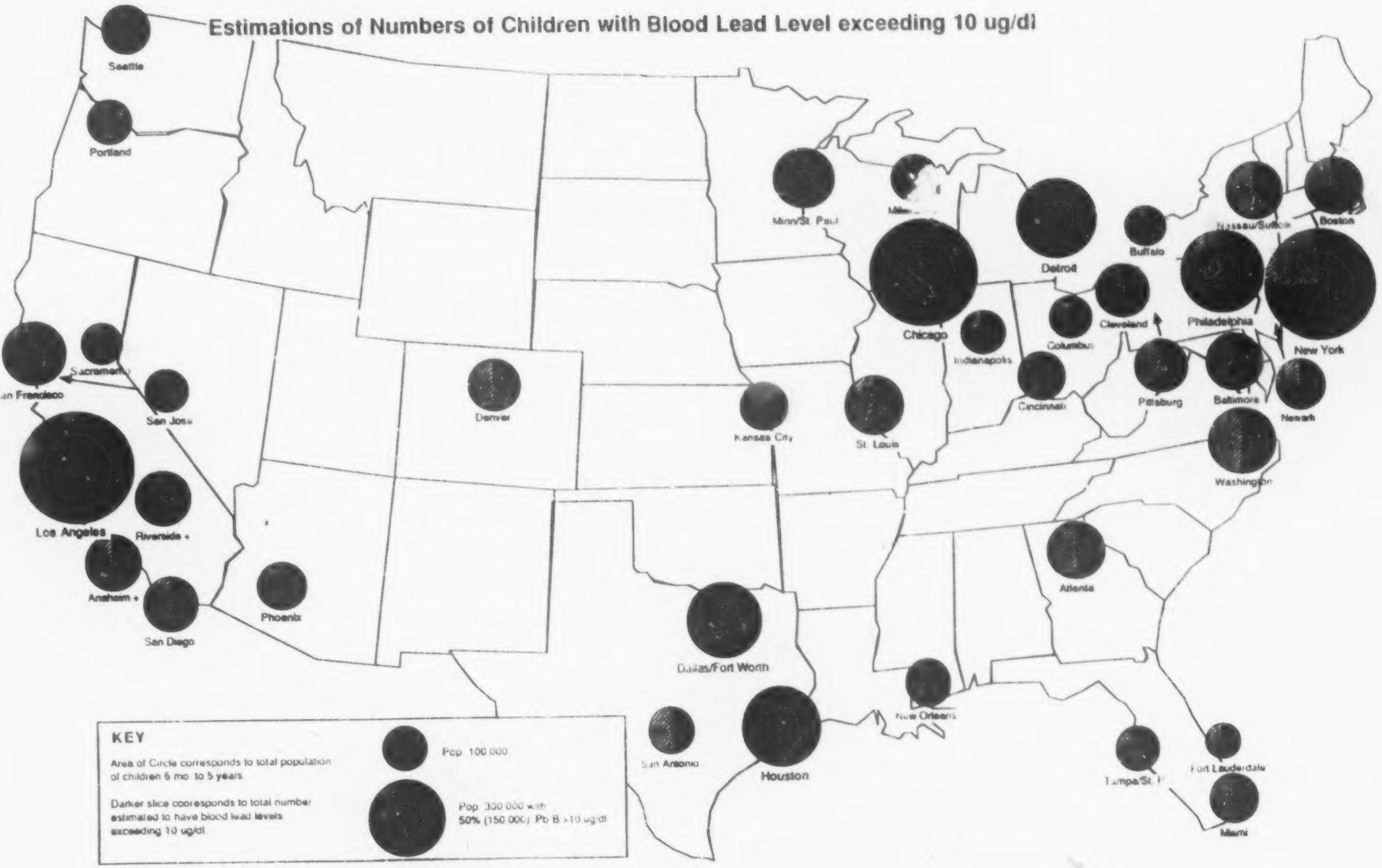
Kansas City
St. Louis
Dallas/Fort Worth
San Antonio
Houston
New Orleans
Indianapolis
Detroit
Columbus
Cincinnati
Cleveland
Buffalo
Pittsburg
Philadelphia
Nassau/Suffolk
Boston
New York
Newark
Baltimore
Washington
Atlanta
Tampa/St. P.
Fort Lauderdale
Miami
KEY
Area of Circle corresponds to total population of children 6 mo. to 5 years.
Darker slice corresponds to total number estimated to have blood lead levels exceeding 15 ug/dl.
Pop. 100,000
Pop. 300,000 with 50% (150,000) Pb B >15 ug/dl

Estimations of Numbers of Children with Blood Lead Level exceeding 10 ug/dl


Seattle
Portland
San Francisco
Sacramento
San Jose
Los Angeles
Riverside +
Anaheim +
San Diego
Phoenix
Denver
Kansas City
Dallas/Fort Worth
San Antonio
Houston
Minn/St. Paul
Chicago
St. Louis
New Orleans
Indianapolis
Detroit
Columbus
Cleveland
Cincinnati
Buffalo
Pittsburg
Atlanta
Tampa/St. P
Fort Lauderdale
Miami
Washington
Baltimore
Philadelphia
Newark
New York
Nassau/Suffolk
Boston
KEY
Area of Circle corresponds to total population of children 6 mo. to 5 years
Darker slice cooresponds to total number estimated to have blood lead levels exceeding 10 ug/dl
Pop. 100 000
Pop. 300 000 with 50% (150 000) Pb B >10 ug/dl

These estimates were derived from data compiled for and discussed in the groundbreaking Report to Congress on Lead Exposure of Children in the United States, submitted in 1988 by the Public Health Service's Agency for Toxic Substances and Disease Registry (ATSDR).

Overall, ATSDR estimated that nearly 3 million children under the age of 6 have lead levels associated with toxicity. Dr. Barry Johnson, ATSDR Administrator, will document his Agency's evaluation that nearly 12 million children live in housing with lead paint that can present such risks. These figures underscore the fact that lead toxicity is one of the most prevalent diseases of children, and one of the few that is entirely preventable.

In many cities, our estimates indicate that over 50% of children under the age of 6 are affected by lead from lead based paint. Among urban minority poor children this number rises in some locations to over 90%. Truly, as Jane Li-fu pointed out almost 20 years ago, there are two ways to kill our children with lead: quickly and slowly. Lead paint poisoning is a slow death of the spirit and of hope, a destruction of the future that threatens to destroy both our most advantaged and our most neglected children.

Thus, the sources of lead for children include both ongoing uses of lead that have been incompletely controlled and past uses of lead that constitute large reservoirs of unabated hazard. Of these reservoirs, lead paint in housing constitutes the most urgent source of ongoing exposure. Dr. Julian Chisolm has described the housing stock of Baltimore as containing "killer houses", where children and their families endure a tragic cycle as they move from unabated home to unabated home, their illness slowed only temporarily as they come to the attention of the lead clinic and are moved from one source to another. This is not prevention.

3. What should we do?

Lead toxicity is a preventable disease. It is probably only preventable, that is, it is not treatable. At the point at which we usually detect lead toxicity by screening children, damage to brain development has already occured. Intervening at that stage requires extensive remedial education and, of course, prevention of further exposure. Preventing lead-based paint poisoning, as Congress recognized in 1971, requires the removal of lead paint from housing. Preventing lead toxicity as a whole also requires effective controls on all uses of lead since no constraint on its release can outlast its hazard.

EDF proposes an innovative and integrated major step for preventing lead toxicity. EDF's proposal is designed to deal with both the ongoing uses of lead and the existing reservoir from its past uses. Its structure is designed to circumvent the regulatory paralysis that has characterized attempts to reduce human exposure to toxic substances evidenced in the past 20 years and to allow the the market to ratchet down on substitutable uses of lead. Moreover, it is designed to provide the public health and housing community with a source of stable funding to support development and management of safe and effective abatement programs at the local level.

In the Report, we describe a proposal for encouraging reductions in the use of lead while stimulating safer methods of lead recovery and reuse for presently non-substitutable uses. At present, lead continues to be used for many products for which substitutes are available or for which recycled lead could provide sufficient resources. Unfortunately, there are no incentives for product substitution or safe lead recycling. Many lead recycling operations in the US at present do not meet environmental or occupational health criteria. Lead substitutes cannot gain entry into the market because of preferences (such as depletion allowances) granted to lead. As discussed above, no use of lead has been completely banned in the U.S. despite two decades of Congressional concern and regulatory action under most of the environmental and occupational statutes of the U.S.

EDF proposes that Congress mandate an excise upon the use of new lead in commerce, imposed at the point of extraction or importation. This excise is to be placed into a National Lead Paint Abatement Trust Fund for the purposes of abating the major reservoir of past lead use now causing highest exposures in children, namely deteriorating lead paint in housing stock in the U.S. Under the guidance of the Public Health Service, safe and effective methods for abating lead paint for those most at risk would be developed and implemented on a city-by-city basis. The trust fund will be sufficient to provide longterm, stable funding for the abatement undertaking, and to ensure that the removal of lead paint does not create more problems than are already associated with lead paint, as Jim Keck from Baltimore will describe.

The excise will also help circumvent reliance on the laborious and slow process of developing use-by-use federal regulations to reduce the release of lead into the environment during production, use, and disposal of lead products. EDF has long experience with the inefficiency of EPA attempts to control toxic substances. We share with many members of this subcommittee a deep frustration over this process. It has taken EPA over 10 years to regulate asbestos, since EDF's petition in 1978, and even after 10 years it will take another 7 years for an incomplete ban on asbestos to take effect for two-thirds of the affected products. For the past three years we have discussed the urgent need EPA to deal with lead as the single most significant preventable disease of environmental origin. In these three years EPA has failed to complete the phasedown of lead from gasoline, promised in 1983; it could not removal lead-lined drinking water fountains from schools without specific Congressional action; it has been unable to promulgate an enforceable health-based drinking water standard for lead, required since 1986; it has not established a new national ambient air quality standard for lead, due since 1982; it has not resolved the crises associated with the ultimate disposal of lead-containing ash from incinerators; it has not set a cleanup standard for dealing with lead contamination at Superfund sites. In December 1989 the Science Advisory Board characterized EPA's lead policies as inconsistent and not based upon a clear commitment to prevent low level toxicity in all persons at risk. Thus, we conclude that the record cannot support reliance upon EPA to resolve the lead epidemic through traditional regulatory measures.

HUD has an even worse record for dealing with lead paint in housing. As Stephanie Pollack from the Conservation Law Foundation will describe, HUD's record in evading the clear mandate to prevent lead based paint poisoning is abysmal. HUD has countermanded the concept of prevention by encouraging the use of poisoned children as signals for investigation, by wrongheaded statements on the nature of lead paint hazards, and by failing to fund abatement programs. Most recently, HUD has failed to meet the latest Congressional deadline last year to produce guidelines for the safe and effective removal of lead paint hazards.

Lead paint abatement will be a major undertaking. Safe abatement requires careful planning, training of workers, and oversight. The costs will be great. However, as several benefit:cost analyses conducted by EPA in the 1980's have demonstrated, the real benefits associated with reducing lead toxicity are also great. A cost:benefit analysis of reducing low level lead toxicity will be included in the forthcoming National Research Council report on lead, as described by Dr. Bruce Fowler at this hearing.

Lead toxicity does not pose a "risk" of health effects; rather, the consequences of this disease are real and documented. The impact upon society as a whole is obvious. The methods of prevention are well known and feasible. To date we have lacked the commitment and the clear path to our goal. We are confident that today's hearing will signal that the national commitment is strong, and that our proposal may provide a path towards achieving the goal of a safe world for our children.

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April 18, 1990

The Honorable Harry Reid
Chairman, Subcommittee on Toxic Substances,
Environmental Oversight, Research and Development
Senate Committee on Environment and Public Works
Room 458, Senate Dirksen Office Building
Washington, DC 20510

Dear Senator Reid:

Enclosed please find EDF's responses to the questions you forwarded to us following the March 5 hearing on childhood lead poisoning. Thank you again for the opportunity to present our views at that important and timely hearing.

We look forward to continuing to work with you on this critical issue affecting the health of the nation's children and adults.

Sincerely,

Ellen Silbergeld/KF

Ellen Silbergeld, Ph.D.
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Responses of the Environmental Defense Fund
to Follow-up Questions from the March 5, 1990 Hearing
of the Subcommittee on Toxic Substances, Environmental Oversight,
Research and Development of the Senate Environment Committee

Responses to first set of questions (questions are in italics, EDF answers are in roman):

> *A. You have estimated the total cost of de-leading two million houses as $10 billion. Does that cost include such items as temporary rehousing of families, economic dislocation, and disposal of the waste?*

The $10 billion figure was derived by multiplying the number of housing units urgently needing abatement because of the presence of peeling lead (two million homes) times the figure of $5000 average abatement cost per unit. That abatement cost was the approximate midpoint of a range of abatement costs reported from a variety of programs. To the best of EDF's knowledge, those costs did not include family relocation, but did include waste disposal. See also EDF's report *Legacy of Lead: America's Continuing Epidemic of Childhood Lead Poisoning*, page 28 (copy attached to EDF's written testimony). We do not understand what is meant by the term "economic dislocation" in this context.

> *B. Where would you suggest we dispose of the waste created by a wide-scale abatement effort?*

The U.S. Environmental Protection Agency has established regulations that govern whether particular waste is hazardous. Under those regulation a waste qualifies as hazardous if it leaches more than 5 parts per million (ppm) of lead when tested by a specific procedure. See 40 C.F.R. Part 261. Abatement wastes that exceed this threshold level would be required to be disposed of in a permitted hazardous waste facility. Some wastes may be exempt from regulation under the "household waste" exemption, which applies to wastes from individual households. EPA has been asked to provide an interpretation as to whether this exemption applies to wastes from contractor removals, but has not yet responded. In EDF's view, the household waste exemption should be narrowly interpreted, in light of the potential for lead-containing abatement residues to be dispersed if not properly stored, transported, and disposed of.

Even for abatement wastes that are not deemed hazardous or that happen not to exceed the regulatory threshold for leachable lead, special precautions must be taken to ensure that lead-bearing chips and dust do not escape during storage or transportation, or after disposal. In addition, because lead can readily leach out in the acidic conditions that may prevail in a municipal landfill as a result of decomposition of organic waste, lead-bearing abatement waste should not be discarded in a municipal landfill along with ordinary garbage.

C. Do we have the superstructure in place to undertake abatement on the scale which you claim is necessary?

Not at present, although the expertise is available in several local health departments and abatement programs (for example, that of Baltimore). Indeed, an important rationale for creation of a substantial Trust Fund is the need to provide multi-year funding that will allow such a superstructure to develop.

D. Can we guarantee the safety of workers engaged in abating lead?

Reasonable guarantees of safety can be made if workers (i) are carefully trained in proper abatement techniques, (ii) are provided with respiratory-protection devices, and (iii) follow thorough personal cleanup procedures before leaving the work site. EDF concurs with the revised report of the abatement guidelines workgroup for the Department of Housing and Urban Development. Two other witnesses at the hearing (Dr. Herbert Needleman and Stephanie Pollack) were members of that workgroup and can provide additional information on its conclusions.

E. If the soil around many of the houses is also contaminated with lead, wouldn't abated houses quickly be recontaminated with lead once people started walking in and out of the houses?

Abatement of deteriorating lead paint will remove a major source of lead, thus lowering total exposure levels in that dwelling regardless of the lead status of the surrounding soils. In order to keep a house lead-free, however, abatement of highly contaminated residential soils may be desirable in conjunction with paint abatement efforts. Current research on the nature and extent of soil contributions to children's lead exposures is underway in Baltimore and Oakland.

F. You propose putting a tax on new lead. Would you expect the imposition of such a tax to cause the closure of the primary lead industry in the United States?

No, because imported lead would also be subject to the tax, and demand (even for nonsubstitutable uses) appears to exceed volume available through recycling. It should also be noted that the primary lead industry overlaps to a substantial extent with the secondary industry (i.e., many companies operate both types of facilities).

G. You suggest that the tax on lead should initially be set at $1.25 per pound. As the tax reduces the supply of virgin lead it would seem to me that the tax would have to be increased to generate the revenues you believe are necessary to de-lead houses. Could you *tell us what you believe the tax would be after seven years? What difference do you think your tax will have on the price of a car battery in seven years' time?*

Congress can determine whether the Fund Administrator should be authorized to revise the fee upward as needed to generate $1.5 billion in annual revenues, or whether instead to establish a maximum upward adjustment and supply any shortfall through other funding sources such as state co-payment, general federal revenues, etc.

H. What percentage of lead batteries are currently recycled?

The most recent data we have seen indicate that about 85% of batteries are currently recycled. While this rate is substantially higher than it was a few years ago, two points must be noted. First, approximately 70 million used auto batteries are generated in the U.S. each year, so the 15% that escape recycling totals about 10 million batteries. Because each battery contains about 18 pounds of lead, this adds up to 180 million pounds of lead discarded each year -- some in landfills, some in incinerators, and some abandoned along roadsides.

Second, the price of primary (virgin) lead is the key factor determining recycling rates. Should the price of primary lead fall dramatically -- as it did in the mid-1980s -- then there is every reason to anticipate that recycling rates would also drop precipitously, perhaps to around 60% as occurred in the mid-1980s. This scenario is by no means implausible; for example, if the National Forest Service grants full mining privileges in Mark Twain National Forest to Doe Run Company (which has already received an exploratory mining permit), the resulting influx of primary lead would be very likely to cause a substantial drop in lead prices.

I. If we assume that each lead battery contains 100 units of lead, how many units are left after recycling?

According to information from GNB, the nation's second-largest battery company, battery-recycling operations generate approximately 1 pound of slag for every ten pounds of lead recovered. GNB states that a small portion of the slag is lead. EDF does not have detailed information on the efficiency of lead-recycling operations.

J. What do you regard as essential uses of lead?

Under current technologic conditions, we regard lead-acid batteries and radiation shielding as two major essential uses of lead; few if any additional uses appear to be both essential and nonsubstitutable.

Responses to second set of questions (questions are in italics, EDF answers are in roman):

1a) What percentage of gasoline contains lead additives at the level common before the introduction of the catalytic converter?

The catalytic converter was introduced beginning with 1975 model cars. At that time, "regular" (leaded) gasoline contained about 1.4 to 1.9 grams of lead per gallon (gpg) of gas, see 41 Fed. Reg. 28352 (July 9, 1976). Since 1986, EPA regulations have limited the amount of lead in leaded gas to 0.1 gpg, see 40 C.F.R. section 80.20(a)(iii).

1b) How much lead does all gasoline contain now?

According to EPA's 4th quarter 1989, 7% of the gas sold in the U.S. is leaded gas. The total amount of lead now used in leaded gas is 1.4 million pounds per year.

1c) What percentage of total airborne lead is the result of lead in gasoline?

EDF does not currently have data on the percentage of airborne lead attributable to the continuing use of lead in gasoline. Such usage, however inevitably contributes to further lead contamination of the environment as virtually all of the lead that is added to gasoline comes out the tailpipe during vehicle operation.

2a) Has the production of lead declined significantly in the past two decades?

The following table summarizes overall patterns of lead use domestically over the past twenty years:

Millions Short Tons of Lead

	Used in Commerce	Mined	Net Imports	Recycled
1970	1361	572	346	597
1989	1331	495	44	803

(Figures do not include additions to or subtractions from producer, consumer, or government stockpiles.)

(Source: Bureau of Mines Mineral Commodity Summaries 1975 & 1990)

2b) How much lead do we introduce into our environment on an annual basis?

Currently, the United States uses about 1.4 million tons of lead in commerce annually. Only a portion of that lead is released in the short term (though, as noted in our testimony, lead's toxicity extends beyond the ability of any containment system to isolate it from the biosphere). According to the data from the EPA Toxics Release Inventory, large industries in the primary manufacturing sector reported releasing or transferring a total of 80,793,706 pounds of lead in 1988.

3) In regards to your legislaive proposal for an excise fee on the production and importation of lead as a way to pay for paint removal from affected homes:

a) Would the proposal tax recycled lead as well as new lead? If recycled lead is taxed, would it be taxed at the same rate as new lead?

EDF proposes that an excise fee be placed on lead at the time of mining or importation but not in conjunction with recycling.

b) How did you determine the level of the excise tax?

The excise was back-calculated from the revenues needed to finance abatement of the estimated 2 million homes that pose the greatest risk -- namely those that contain peeling lead paint. We further assumed an average abatement cost per unit of $5,000, yielding a total cost of $10 billion. Allowing a 7-year duration for this program, the fee would be set to generate annual revenues of approximately 1.5 billion per year (i.e., $10 billion total cost divided by 7 years). In 1988, U.S. production and importation of lead totaled 600,000 tons. That figure was in turn divided into the desired $1.5 billion annual revenue to yield a rate of $2500 per ton, or $1.25 per pound.

What do you anticipate the effects of the tax will be? In addition to providing funds for abatement projects, will it also encourage industry to substitute for lead where possible?

c. The tax is intended to raise the price of lead and thus (i) prompt product manufacturers to use substitutes where feasible and (ii) stimulate recycling efforts.

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TESTIMONY BEFORE THE SUBCOMMITTEE ON
TOXIC SUBSTANCES, OVERSIGHT,
RESEARCH AND DEVELOPMENT
OF THE SENATE COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS

March 8, 1990

Stephanie Pollack
Director,
CLF Lead Poisoning Project

Like many lead poisoned children, the problem of lead poisoning has been misdiagnosed.

Lead poisoned children often have no symptoms or only general symptoms such as fatigue and stomachaches. Because of this, many cases are misdiagnosed or overlooked and the social costs of this preventable disease are sorely underestimated. No one will ever know how many cases of anemia were wrongly attributed to poor diet, how many cases of stomach cramps and vomiting were misdiagnosed as indigestion or the flu. No one can guess how many children have been labeled slow, difficult, hyperactive, clumsy or lazy when lead was, in fact, interfering with their learning and development.

Like these children, the lead poisoning epidemic has been misclassified -- as a "housing" problem. But the presence of toxic lead in the home is no more a housing problem than the presence of radon or asbestos, which have always been treated as environmental problems falling within the jurisdiction of the Environmental Protection Agency and health officials.

Simply by holding this hearing, the Committee is asserting an important truth: lead poisoning is an environmental health problem. It is time to recognize the lead "problem" for what it is: the most widespread environmentally-caused health problem facing America's children. Once properly classified as an environmental health problem, the treatment for lead poisoning seems obvious: removing lead from children's environments before it causes irreversible damage to their brains and learning ability.

Federal Efforts to Date

While this diagnosis and prescription seem straightforward, the federal government has yet to acknowledge and adopt a preventive approach to lead poisoning. Neither Congress nor any health or environmental agency has set as its goal the elimination of this man-made and completely preventable disease.

Instead, efforts to date have been piecemeal. Regulatory authority over lead is scattered among at least six agencies: the Centers for Disease Control (CDC), Consumer Product Safety Commission (CPSC), Department of Housing and Urban Development (HUD), Environmental Protection Agency (EPA), Food and Drug Administration (FDA) and Occupational Safety and Health Administration (OSHA). Their tasks are divided up as follows:

- CDC oversees local and state efforts to screen (test) children for lead poisoning, although it had no money for categorical grants during the 1980s;[1]
- CPSC administers the ban on specified uses of lead paint,[2] although the agency has never acted to ban the manufacture of lead paint;
- EPA has the authority to address lead under a variety of statutes,[3] although its ambient air quality standards and drinking water standards for lead are a decade out of date and it has failed to ban the addition of lead to gasoline;
- HUD is required by the Lead-Based Paint Poisoning Prevention Act to protect occupants from the hazards of lead paint in federally owned and subsidized housing[4] but has made little progress in the almost 20 years since passage of the 1971 statute;
- FDA is responsible for controlling the level of lead in the food supply, although to date it has relied on voluntary industry efforts to reduce the use of lead-soldered food cans and limit the amount of lead in infant formula; and
- OSHA sets occupational safety standards for workers exposed to lead, although the current standard exempts the construction industry and thus the workers who are engaged in the removal or abatement of lead paint from housing.

In the past few years, this Committee has specifically addressed lead exposure in the 1986 Superfund amendments[5]

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[1] The categorical grants program created by the LBPPPA was eliminated by the Omnibus Budget Reconciliation Act of 1981. Pub. L. No. 97-35, § 2193(b), 95 Stat. 357, 827 (1981). Categorical grants for lead screening were created anew by the Lead Contamination Control Act of 1988, Pub. L. No. 100-572, § 566, codified at 42 U.S.C. § 247b-1, but appropriations to date have been made at only a fraction of the authorized level.

[2] 42 Fed. Reg. 44,149 (1977), codified at 16 C.F.R. Part 1303.

[3] Lead is a criteria pollutant under the Clean Air Act and the subject of an Interim Primary Drinking Water Regulation under the Safe Drinking Water Act. EPA regulates lead as a gasoline additive under the Clean Air Act. EPA can also regulate exposure to lead using authority granted by the Federal Water Pollution Control Act, Resources Conservation and Recovery Act, and Toxic Substances Control Act.

[4] 42 U.S.C. § 4822.

[5] Pub. L. No. 99-499.

(creating an $11 million soil removal demonstration program and requiring preparation of a report to Congress), the 1986 amendments to the Safe Drinking Water Act[6] (banning the use of lead pipe and solder in potable water systems), the Lead Contamination Control Act[7] (addressing lead in water fountains and school drinking water) and two EPA appropriations riders (one on lead gasoline and agricultural vehicles, one on EPA research and policy on lead paint). In addition, Congress revisited the 1971 Lead-Based Paint Poisoning Prevention Act (LBPPPA) three times in 1987 and 1988[8] and attached lead-related riders to the last two HUD appropriation bills.

With respect to HUD, Congress' more recent interventions were necessitated by the Department's unforgivable failure to protect the generations of children that have lived in public and subsidized housing during the past twenty years. A decade after passage of the LBPPPA, the General Accounting Office accused HUD of failing to fulfill its responsibilities under the Act.[9] A federal appeals court agreed in 1983,[10] but the Department's inadequate regulations were not revised until 1986. These revised regulations explicitly treated children as "mine canaries," requiring no testing for lead paint until after a child was found to be lead poisoned. It was this so-called "health approach" that Congress found particularly reprehensible and that prompted enactment of 1987 amendments to the LBPPPA designed to limit HUD's discretion and force the agency to take action to provide for the removal of lead paint from public housing over a five year period slated to begin this fall.

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[6] Pub. L. No. 99-399, § 109, codified at 42 U.S.C. § 300g.

[7] Pub. L. No. 100-572, codified at 42 U.S.C. §§ 300j-21 - 300j-25.

[8] Pub. L. No. 100-242, § 566(a), 102 Stat. 1945, amended by Pub. L. No. 100-628, § 10288, 102 Stat. 3280 (1988), codified at 42 U.S.C. § 4822.

[9] United States General Accounting Office, HUD Not Fulfilling Responsibility to Eliminate Lead-Based Paint Hazard in Federal Housing (1980) (Doc. No. CED-81-31).

[10] Ashton v. Pierce, 716 F.2d 56, modified 723 F.2d 70 (D.C. Cir. 1983).

The Task Ahead for Congress

The dire need for a re-evaluation of the federal approach to lead is more than amply illustrated by the fact that HUD used the terminology "health approach" to describe a regulatory system that allowed children to become irreversibly lead poisoned in order to help the agency identify which units to abate. The time has come for a true "health approach" -- one that would emphasize the importance of the health of pre-schoolers by requiring the removal of lead from housing and the environment before children are irreversibly poisoned.

Congress can do at least four things to spur federal efforts to prevent lead poisoning. First, this Committee and others must prod agencies to exercise the full extent of their regulatory authority to reduce lead exposure. The time has come for a ban on manufacture of leaded gasoline and new standards for lead in the ambient air, in drinking water and in the workplace (particularly for the construction trades).

Second, Congress must provide these agencies with ample funding to carry out this mission. This includes funding for research and development, development of regulatory standards, screening programs and paint abatement. In particular, CLF urges each member of this Committee to work for:

- Full funding of the $24 million authorized for CDC's categorical lead screening grants under the Lead Contamination Control Act of 1988; and
- The creation of a $10 million program to develop and/or evaluate new technologies and techniques for lead paint abatement.

This latter program is particularly critical, since most abatements are conducted the same way in 1990 as they were in 1960. Technology development is a good investment: if we can halve the unit costs of abatement, we can clean up twice as many apartments for the same amount of money.

Third, Congress can help to ensure that all of the agencies that work on lead issues are working together. The level of coordination and cooperation has improved in the past year, but a more concerted effort needs to be made among the agencies to divide up responsibilities in a rational way and ensure that each carries out its role promptly and effectively.

Finally, the time has come for Congress to begin the process of laying out a strategic plan for the complete elimination of lead poisoning. This process will be informed by a HUD report to Congress due in September of this year and by efforts now underway within the Department of Health and Human Services. Congress, however, has the ultimate responsibility for creating the framework needed to eradicate this man-made and completely preventable disease.

Conclusion

The current epidemic of lead poisoning is a scandal and a tragedy. It is scandalous because the disease is completely preventable. It is tragic because the disease strikes young children just starting out in life and because it disproportionately burdens those children already saddled with all the problems associated with being poor and/or a minority in urban America.

But perhaps most importantly, lead poisoning is an environmental problem whose solution properly lies largely in the hands of health and environmental agencies and of this Committee. Lead poisoning is destroying one of this nation's most valuable natural resources, for as Walt Disney observed "Our greatest natural resource is the minds of our children."

TESTIMONY FOR THE UNITED STATES SENATE SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT

* * * * * *

March 8, 1990

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INTRODUCTION

In recent years there has been a growing concern with the effects of low-dose lead exposure on specific sensitive sub-groups of the U.S. population. Young children, pregnant women, workers and geriatric persons are examples of groups within the general population which have been identified as being at particular risk. In addition, it has been known for years that individuals within the same population groups also vary greatly and recent studies in rodents have indicated tissue, sex, and age differences in the intracellular binding-patterns of lead within target cell populations. Such data raise the possibility of beginning to define individual risk in more precise molecular terms based on genetic expression of these molecules.

The effects of lead on target organ systems such as the nervous and hematopoietic systems have been known for many years, but more recent data indicate that other organs such as the kidney, cardiovascular, skeleton, and reproductive organ systems are also highly sensitive to this agent. The public health implications of these data with regard to the role of lead in end stage renal disease (ESRD), hypertension, osteoporosis, and a variety of reproductive disorders are enormous and only now being elucidated. In order for the role of lead in these important clinical disorders to be rigorously evaluated, there is a pressing need for more sensitive and specific techniques capable of more cellular manifestations of lead toxicity in target cells of critical human populations. Fortunately, there are a number of either new or refined analytical methodologies which are under development for resolving these issues.

Specific techniques and their possible applications with regard to lead dosage and effects in critical populations are briefly described below.

1. IN VIVO X-RAY FLUORESCENCE (XRF) FOR LEAD IN BONE

This technology which is now in late development stages measures either the K or L x-ray lines for lead in the skeleton following excitation by incident x-rays of specific energies. The approach should revolutionize current methods for assessing lead exposure given the fact that approximately 90-95% of internal lead body burden is present in the skeleton and that it has a normally slow turnover which is on the order of decades. In addition, this technique may also prove to be of enormous value in following the efficacy chelation therapies and alterations in the dynamics of lead in bone during pregnancy and osteoporosis. Proceedings from the International Workshop on "Lead in Bone: Implications for Dosimetry and Toxicology" will provide a current review of the literature for this technique.

2. IMPROVED ANALYTICAL METHODOLOGIES FOR DETECTING LEAD-INDUCED ALTERATIONS IN HEME BIOSYNTHESIS AND THE UTILIZATION OF PORPHYRINS AS BIOLOGICAL INDICATORS OF LEAD TOXICITY

In recent years, improved analytical methods, such as high performance liquid chromatography and tandem mass spectrometry may be used to "speciate" disturbances in the heme biosynthesis pathway such that the effects of lead on this highly sensitive system which result in elevations of porphyrins or other heme precursors in blood and urine may be differentiated from the effects of other agents such as alcohol, solvents, or other metallic agents (e.g., mercury or arsenic). Volume 514 of the Annals of the New York Academy of Sciences (Mechanisms of Chemical Induced Porphyrinopathies, E. K. Silbergeld and B. A. Fowler, eds.) contains a recent review of the relevant literature.

3. THE ROLE OF LEAD IN HYPERTENSION

There is a growing body of information from both experimental animals and human studies which suggest that lead may play a role in the development of hypertension via alteration in the renin-angiotensin system. Given the massive public health implications of this data and the fact that individuals appear to vary in their sensitivity to this phenomenon, an examin- of this effect is clearly warranted with a focus on the factors which influence susceptibility. Such factors should include genetic/molecular, nutritional and physiological factors (e.g., pregnancy) which could predispose an individual to hypertension. Volume 78 of Environmental Health Perspectives provides a recent review of lead and hypertension.

4. MOLECULAR FACTORS WHICH MAY INFLUENCE INDIVIDUAL SUSCEPTIBILITY TO LOW-DOSE LEAD TOXICITY

Recent studies have demonstrated the presence of high affinity lead-binding proteins (PbBP) in target tissues (brain and kidney) of rodents. These molecules of kidney appear to share biological properties similar to "receptors" for other biologically active substances with regard to high affinity, low capacity, target organ distribution ability to facilitate intracellular movement of lead and chromating binding. They have also been demonstrated to mediate the inhibitory effects of lead on the delta-aminolevulinic acid dehydratase (ALAD) to both kidney and brain. The advent of radioimmunoassays for these proteins and their hypothesized human analogs may permit a more accurate delineation of probable individual responsiveness to a given lead dosage.

5. ROLES OF NUTRITION FACTORS IN THE SUSCEPTIBILITY TO LEAD TOXICITY

There is a substantial body of experimental and clinical literature which indicates that nutritional status plays a role in mediating both the gastrointestinal absorptions and toxicity of lead. While the exact molecular mechanisms by which essential elements such as calcium influence the biological activity of lead are presently unknown, there are data suggesting that lead and calcium compete with each other for binding sites on effector molecules within target cells. Further, basic research is needed to understand the mechanisms of nutrient-lead interactions so that the extent to which these important interacting factors may be more accurately assessed. The testimony provided by Dr. Mahaffey in this area is particularly relevant.

6. CONCEPTUAL EVALUATION OF CRITICAL POPULATIONS

As noted in the introduction, there are a number of identified sub-populations at increased risk for lead toxicity. These groups include the very young, pregnant women and concomitantly fetuses of women with elevated lead exposure, geriatric populations and those with a genetic predisposition to lead toxicity based on inherited differences in cellular metabolism of lead. There is a need for the development of a conceptual framework focused around a discussion of why such individuals are at special risk so that the regulatory or public health may actually define the terms "critical populations." For example, are fetuses more susceptible to lead because they are rapidly growing and have high protein and heme rates which are more sensitive to the effects of lead or are the placenta which may be of greater importance? Is this special sensitivity to lead created by a combination of such factors? The value of such an exercise would be of much greater help to better define and justify the application of the analytical methodologies discussed previously to health problems asso-ciated with low-dose lead exposure in these populations. There is a pressing need for a clear definition of what constitutes a "critical population", why these individuals are at special risk and how the new methodologies will assist in more accurately assessing that risk.

RESPONSE OF FEDERAL AGENCIES AND NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL

In anticipation of the needs noted above, the Agency for Toxic Substances and Disease Registry (ATSDR) requested that the National Academy of Sciences/National Research Council (NAS/NRC) form a committee to evaluate the state of scientific knowledge with regard to "Measuring Lead in Critical Populations." The specific charge to the committee which was accepted by the NAS/NRC is as follows:

> **The Committee will identify and evaluate methods for measuring environmental exposures to lead in critical populations, e.g., children under two years of age, and pregnant women. The study will especially emphasize techniques for measuring very low lead body burdens, e.g., blood lead levels below 25-30 mg/dl, and particularly those techniques that are suitable for screening and diagnostic purposes. Techniques such as x-ray fluorescence, isotope dilution, and enzyme-specific assays, among others, will be considered and evaluated. The Committee will produce a report that will recommend options for research strategies to refine techniques for measuring lead in biological matrices.**

A copy of the Committee Roster is attached.

The report of the Committee, scheduled for release on September 30, 1990, considers the following topic areas: historical perspective on the lead problem, sources of exposure to critical populations, adverse health effects, definition of critical populations, biokinetics and physiology of markers of lead exposure, quantitation assessment of lead exposure and early toxic effects, societal costs and the benefits of reducing lead exposure, and trends and developing needs.

NATIONAL RESEARCH COUNCIL
BOARD ON ENVIRONMENTAL STUDIES
AND TOXICOLOGY
2101 Constitution Avenue Washington, D.C. 20418

COMMITTEE ON MEASURING LEAD EXPOSURE IN CRITICAL POPULATIONS

February 13, 1990

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April 16, 1990

The Honorable Senator Harry Reid
Chairman, Subcommittee on Toxic Substances,
Environmental Oversight, Research and Development
United States Senate
Washington D.C. 20510-6175

Dear Senator Reid:

Thank you for your letter of March 22, 1990 requesting me to respond to your folow-up questions from the March 8, 1990 hearing on the long-term health effects of lead exposure. My responses to your questions are as follows:

1. In my opinion, the best way to measure lead in children is via the bone or calcified tissue stores since lead is preferentially deposited in these sites with a half-life on the order of decades. Such measurements would hence give a more integrated picture of long-term lead exposure which would not be subject to the well-known fluctuations in blood lead that accompany episodic high-dose lead exposure. An example of this phenomenon is described in the attached reprint by Rosen et al. I would also note that any condition which caused demineralization of the skeleton, such as pregnancy would be expected to also release lead stores from bone. This could be a particular problem in populations of children at risk for teenage pregnancy. As noted in my testimony, the X-ray fluorescence technology for measuring bone lead is in late stages of development and I am hopeful that once various technical and radiation safety issues are resolved, this technology will be more widely available.

2. The results of monitoring blood and tooth lead values might agree if lead exposure was constant and there were no episodic high-dose exposures in the history of the child. Blood lead values are generally regarded as a measure of exposure occurring during the past few weeks whereas tooth lead measurements would provide a record of lead exposure over time and could include episodic high exposures during the life-time of the tooth. Comparisons of lead in blood and teeth require careful interpretation for these reasons.

3. I would not recommend conducting such exptrapolations since the precise toxicokinetics between dentine and blood have not been well-characterized.

Dental School · Graduate School · School of Law · School of Medicine · School of Nursing · School of Pharmacy · School of Social Work
Maryland Institute for Emergency Medical Services Systems

4. Most experts in the field do not place great faith in finger-stick blood lead determinations due to the possible problem of external contamination. Intravenous blood lead sampling is recommended.

5. I would estimate that accurate blood lead determinations with appropriate quality assurance/quality control would cost between $20-35 each depending upon the number of samples analyzed per year.

6. At present, there are not a sufficient number of centers in the country to conduct either the blood or bone lead measurements if millions of children needed testing. Any large-scale screening program of the U.S. population for lead exposure would require additonal resources in order to be successful.

I would like to thank you and Senator Lieberman for the opportunity to testify on this important public health issue and to respond to the above questions. Please feel free to contact me if I can be of any further assistance.

Sincerely,
Bruce A. Fowler
Bruce A. Fowler Ph.D.
Director, Program in
Toxicology

STATE OF NEVADA
DEPARTMENT OF HUMAN RESOURCES
HEALTH DIVISION
BUREAU OF REGULATORY HEALTH SERVICES
CONSUMER HEALTH PROTECTION SERVICES
505 E. King Street
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BOB MILLER
Governor

JERRY GRIEPENTROG
Director

MYLA C. FLORENCE
Administrator

April 9, 1990

The Honorable Harry Reid
United States Senate
708 Hart Office Building
Washington, D.C. 20510

Dear Senator Reid:

This is in response to your March 22, 1990 letter containing follow-up questions to the recent Subcommittee on Toxic Substances, Environmental Oversight, Research and Development hearing regarding the long term health effects of lead exposure.

1. Is there a statewide data base on blood-lead levels in Nevada?
   There is no statewide data base on blood-lead levels in Nevada.

2. Do any other states have such data bases?

   I do not have information regarding other state's data bases. The U.S. Centers for Disease Control might be able to provide this information.

3. How widespread do you think the problem of lead-contamination water is in Nevada?

   There has been no statewide monitoring for lead in drinking water. This will be a requirement beginning 18 months following U.S. EPA's promulgation of the Lead in Drinking Water Rule. The Southern Nevada Water System, the largest water supplier in Nevada, treats their water to make it non-corrosive to lead. Studies conducted by Westpac Utilities, the second largest water supplier in Nevada, indicate lead contamination in newer homes (less than 12 years old). Westpac plans to begin treating their water to make it non-corrosive next year. These two utilities serve approximately 75 percent of all Nevada citizens. Lead has been monitored in only a fraction of the state's other 331 community water systems, 109 non-transient water systems (including schools) and individual wells. Lead has not been detected in any of these water systems. Generally, groundwater in Nevada is in the range of non to slightly corrosive to lead. All but 36 of the other 331 community water systems and virtually all of the 109 non-transient water systems and individual wells are served by groundwater.

4. How effective has the EPA been in assisting the states to develop standards and guidelines on safe drinking water?

   EPA's guidance regarding health risks, and the identification and mitigation of lead in drinking water has been very helpful to states. EPA plans to promulgate a final lead in drinking water rule this September. States might find it difficult to implement the regulation without additional guidance.

5. Do Nevada's school districts have sufficient resources to test their water supplies for lead?

   Some rural county school districts have indicated that lead testing will be a financial burden. Consequently, some school districts have utilized the services of a private laboratory that is not certified by the Nevada State Health Division. The private laboratory is less expensive than the Nevada State Health Division laboratory, but tests are not conducted in accordance with EPA and State Health Division procedures.

6. Do you have any estimate of the cost of replumbing Nevada's schools to reduce the likelihood of lead contamination?

   I cannot estimate the statewide cost. As an example of a single incident, the replacement of plumbing in Washoe County schools where high lead levels were detected in drinking water was accomplished by school district personnel and required minimal material costs. The more cost-effective approach is to treat the water so that it will be non-corrosive to lead. EPA has estimated that the cost for a large system to provide corrosion control treatment is $1 per household per year. The cost for a small system (serving less than 500 people) is $27 per household per year.

7. What actions can schools do to reduce the likelihood of lead contamination?

   The forthcoming EPA rule regarding lead in drinking water will reduce the likelihood of lead contamination in schools. In the interim, schools should test their supplies to determine if there is lead contamination. If so, schools can remove from service, any fountains that exceed the recommended lead level. Also, schools can routinely run the water in the individual faucets for 30-60 seconds every morning.

Please feel free to contact me if you need additional information.

Sincerely,

Jeffrey Fontaine

Jeffrey A. Fontaine, M.P.H., P.E.
Supervisor, Public Health Engineering
Consumer Health Protection Services

cc: Myla C. Florence, Administrator, State Health Division
Darrell Rasner, Supervisor, Environmental Health

TESTIMONY on Rhode Island State Efforts to Control Lead Exposure and its Toxic Health Effects.

Presented to the **Subcommittee on Toxic Substances, Environmental Oversight, Research and Development, United States Senate**, Washington, D.C., on March 8, 1990.

Presented by Bela T. Matyas, M.D., M.P.H., Chief, Office of Environmental Health Risk Assessment, Rhode Island Department of Health.

Mr. Chairman, my name is Dr. Bela Matyas and I represent the Rhode Island Department of Health. I would like to thank you and the members of the Subcommittee on Toxic Substances, Environmental Oversight, Research and Development for inviting me to testify on lead and its effect on children's health and educational performance.

The Rhode Island Department of Health recognizes exposure to lead as being the state's most important environmental health hazard and has established the Childhood Lead Screening Program in order to address this hazard. The Program, working with an extensive referral network of Rhode Island pediatricians, screens children for elevated blood lead levels, focusing particularly on high-risk neighborhoods. In 1989, the Program and its referral network effectively screened over 21,000 children and detected 716 cases with elevated blood lead levels. This represents a continuing increase in the numbers of children screened and detected annually despite the loss of 60% of the Program's 1981 purchasing power.

However, there are a number of very significant limitations to programs which rely solely on screening and case-finding (i.e., secondary prevention strategies) for addressing the hazards of environmental lead exposures. Specifically, a substantial number of children with elevated lead levels will continue to go unscreened and undetected due to the ubiquity of lead and practical resource limitations.

Secondly, the available screening tests are ineffective at reliably detecting blood lead levels known to be associated with certain types of irreversible, low-level lead toxicity.

Finally, while a secondary prevention strategy for lead toxicity identifies existing cases, it does not prevent cases because it does not address the actual causes of lead toxicity. Children with elevated blood lead levels potentially incur significant damage to the central nervous system and other organs in the time before they can be identified by screening and referred for treatment. The sources of lead exposure need to be identified and abated if exposures and re-exposures are to be prevented. Otherwise, children will be identified, treated and then returned to the very same environment that caused their initial toxicity.

In summary, a secondary prevention strategy is a very effective mechanism for preventing overt lead poisoning, with such complications as severe encephalopathy and death. However, it cannot prevent the more subtle and insidious effects of lead toxicity that can significantly and permanently impair the health and educational performance of very large numbers of children. Addressing these latter impacts requires a primary prevention strategy that emphasizes risk assessment and risk reduction.

The Rhode Island Department of Health recognizes the need for this critical shift in emphasis. The Department has proposed legislation to establish a primary prevention program for lead, modelled largely on its existing asbestos abatement program.

A primary prevention strategy for lead is described in the attachment to my written comments. Briefly, this strategy includes the following components:

The first component is Risk Assessment, which includes

- development of standards and protocols for conducting home inspections for lead;
- requiring environmental lead risk assessments as part of real estate transfers and for all rental units; and
- identification of high-risk areas for lead exposure;

The second component is Risk Reduction, which includes

- developing training and work practice requirements for lead abatement;
- licensing/certification of inspectors, contractors, consultants, training courses, and laboratories; and
- providing financial assistance for abatement to low-income property owners; and finally

The third component of a primary prevention strategy is Public Education and Outreach Activities, including

- aggressive public education regarding exposures to lead, lead toxicity, environmental lead risk assessment, and risk reduction.

In order to effectively adopt and implement primary prevention strategies for lead there are a number of things which need to be done at the federal level. A single lead federal agency should be responsible for all aspects of childhood lead poisoning. The current situation involving multiple agencies with lead-related responsibilities lacks focus and dilutes resources.

In addition, significantly better information is needed regarding many aspects of primary prevention, including the development of standards for environmental exposures to lead and appropriate abatement of lead-contaminated soils and dusts. Gathering these types of information will require coordination and substantial resources that are only available at the federal level.

And finally, primary prevention for lead is a very expensive proposition. However, resources spent in addressing the prevention of lead toxicity are in general likely to be far more cost-effective than those spent addressing most other environmental health hazards. For example, if the resources currently alloted to the Superfund program were to be used to fund residential lead abatement activities, the net beneficial impact on the health of the U.S. public would undoubtedly be far greater. In view of this, I would strongly urge this Subcommittee to take the necessary actions to release Superfund money to help fund residential lead abatement.

The impacts of environmental exposures to lead, particularly the effects on the health of our children, are unquestionably tremendous. These impacts, however, are preventable. The most essential element required to begin tackling this lead problem is the political will to do so.

ATTACHMENT

A primary prevention strategy for lead should include at least the following components:

Risk Assessment:

- Development of standards and protocols for conducting home inspections for environmental lead exposure sources, including the assessment of lead in paint, soil, dust, and drinking water (i.e., an environmental lead risk assessment);
- Development of a governmental capacity to perform environmental lead risk assessments for: 1) low-income property owners who are unable to afford inspections otherwise, 2) inspection of the homes of confirmed cases of childhood lead poisoning in a timely manner, and 3) assessing the scope and extent of environmental lead exposures in the state (or appropriate locality);
- Requiring either an environmental lead risk assessment or certification that the home is lead-free on the basis of a previous such assessment as part of real estate transfers;
- Requiring an environmental lead risk assessment (or certification that the home is lead-free on the basis of a previous such assessment) of all rental units on a phased-in basis initially and periodically thereafter, and the notification of all current tenants and prospective tenants (at re-rental) of the results of the most recent assessment;
- Identification of high-risk areas for lead exposure within the state (or appropriate locality) in order to better target limited educational resources and government-provided inspection services;

Risk Reduction:

- Development of requirements for both worker training and appropriate work practices for contractors involved in lead abatement;
- Licensing of abatement contractors and supervisors;
- Certification of lead inspectors (persons performing environmental lead risk assessments), abatement consultants, training courses, and laboratories;
- Approval of abatement plans, at least for such high

risk settings as schools, day care centers, and homes or rental units with confirmed cases of childhood lead poisoning;

- Inspection of abatement jobs on a priority basis, which should include routine inspection of high risk settings (i.e., schools, day care centers, and homes or rental units with confirmed cases of childhood lead poisoning), and random inspection of other settings;

- Provision of financial assistance (in the form of subsidized loans, etc.) to low-income property owners (as defined by appropriate economic/financial criteria) for abatement activities;

- Development of a mechanism to ensure that homes found to be at high risk of lead exposure on the basis of an environmental lead risk assessment are appropriately abated within a reasonable time;

Public Education and Outreach Activities:

- Aggressive public education regarding exposures to lead, lead toxicity, environmental lead risk assessment, and risk reduction and lead abatement, utilizing available conduits for community education (newspapers, television and radio, libraries, social clubs, town meetings, community groups, environmental groups, parent-teacher associations, etc.) and formal education (day care settings, preschools, and grammar schools);

- Development and maintenance of a telephone referral resource to respond to information requests and to provide the public with updated lists of licensed and certified testers, consultants, contractors, and laboratories.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF HEALTH

April 13, 1990

Senator Harry Reid
Chairman,
Subcommittee on Toxic Substances, Environmental
Oversight, Research and Development,
Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510-6175

Dear Senator Reid,

Thank you again for inviting me to testify at your Subcommittee's recent hearing on the health effects of lead exposure. Enclosed are responses to the follow-up questions sent by your Subcommittee.

Sincerely,

Bela T. Matyas, MD, MPH
Chief,
Office of Environmental
Health Risk Assessment

Enclosures

CANNON BUILDING, Three Capitol Hill, Providence, Rhode Island 02908-5097
Telecommunication Device for the Deaf (TDD): 277-2506

Responses to Follow-up Questions of the United States Senate Subcommittee on Toxic Substances, Environmental Oversight, Research and Development, Regarding Health Effects of Lead

What help has Rhode Island received from the federal government to address the problem of lead poisoning?

Rhode Island has received limited federal funding since 1977 to address childhood lead poisoning. This funding has consisted primarily of categorical federal grants for lead poisoning from 1977 to 1981 and allocations from block federal grants (Maternal and Child Health Block Grant) from 1982 to the present:

1977	$ 103,359	categorical grant
1978	122,581	" "
1979	125,520	" "
1980	168,890	" "
1981	195,000	" "
1982	128,270	MCH block grant
1983	119,301	" " "
1984	122,918	" " "
1985	120,000	" " "
1986	150,000	" " "
1987	150,000	" " "
1988	150,000	" " "
1989	150,000	" " "
1990	150,000	" " "

This federal funding has been used to supplement state funding for the Childhood Lead Prevention Program, which screens Rhode Island children aged 1-6 years old for signs of lead poisoning.

Rhode Island also received approximately $80,000 per year for the five years 1984-88 for childhood lead poisoning prevention through the Special Projects of Regional and National Significance (SPRANS) project of the New England Consortium of Childhood Lead Poisoning Programs (NECCLPP). A short description of NECCLPP is enclosed.

In addition, the Rhode Island Department of Health Laboratory has participated in a federal proficiency program for lead analysis.

Are lead abatement efforts in the states hindered by the lack of a coherent strategy in Washington, DC to deal with the matter?

In short, yes. Even if Rhode Island were to adopt regulations for certification and training of lead abaters and for proper lead abatement work practices, effective lead abatement would be severely hindered by the lack of a coherent federal strategy concerning lead abatement. A coherent federal strategy is required with regard to such issues as: what constitutes adequate lead abatement; appropriate lead abatement techniques for specific work situations; appropriate "safe" soil and dust levels for lead; appropriate methods for lead testing in dusts; development of standards for environmental exposures to lead; appropriate methods for abatement of lead-contaminated soils and dusts; and how to abate homes most cost-effectively. Another significant hindrance to lead abatement efforts is insufficient public education about the hazards of lead and the need for lead abatement; a coherent federal strategy regarding lead abatement would substantially enhance any public education related to lead.

What does Rhode Island do with the waste from its abatement efforts?

Wastes generated in lead abatement are generally classified as non-hazardous in Rhode Island. By regulation, abatement wastes need to be tested to determine whether they meet the requirements for hazardous waste. In practice, nearly all lead abatement-related waste is ultimately regulated as non-hazardous solid waste and is disposed of at the state landfill or at some other nearby landfill. The actual disposal of wastes generated in lead abatement activities is not monitored. Lead abatement-related wastes currently generated in Rhode Island are largely restricted to lead-contaminated paint wastes; little, if any, lead-contaminated soils are disposed of in connection with lead abatement activities at present.

Did you have any difficulty in finding workers who were trained to do lead abatement?

Finding workers in Rhode Island who are properly trained to do lead abatement is generally difficult. Rhode Island currently has no certification or licensing program for lead abaters, so any individual or company is effectively free to sell itself to Rhode Island residents as being capable of performing lead abatement. Rhode Island residents who call the Department of Health for help in identifying qualified lead abaters are referred to firms in Massachusetts (which has an aggressive licensing and certification program).

How much does it cost to delead a house in Rhode Island?

The cost of deleading a house in Rhode Island is highly variable. Important factors affecting the cost include: the extent of deleading required, the degree of lead contamination of paint, soil and dusts, the size of the home, the distance to nearby disposal facilities, and the specific deleading methods used. The abatement of lead hazards, as opposed to complete removal of lead (deleading), is generally far less expensive.

The estimated average cost for minimal abatement (involving removing paint from window sills, door frames, and other chewable surfaces, and covering remaining painted surfaces with wallpaper or panelling; lead-contaminated soils and dusts not addressed):

for a 2-bedroom apartment is about $ 800-1500,
for a typical 1-family home is about $ 1200-2500.

The average costs for deleading are more variable. The estimated cost of deleading the interior of a home may average:

for a 2-bedroom apartment, about $ 2500-5000,
for a typical 1-family home, about $ 5000-8000.

Deleading the interior and exterior of a home (not including removal of lead-contaminated soil) is estimated to average:

for a 2-bedroom apartment, about $ 5000-10000,
for a typical 1-family home, about $ 9000-17000.

Removal of lead-contaminated soil involves excavation costs, transportation costs, and disposal costs. In Rhode Island, disposal costs for solid waste are about $50 per ton for a homeowner at the state landfill. Removal of lead-contaminated soil, then, is estimated to cost:

for excavation of 4500 square feet to a depth of 6 inches:

excavation and transport about $ 3000-4000, and
disposal about $ 4000;

for excavation of 9000 square feet to a depth of 6 inches:

excavation and transport about $ 4500-6000, and
disposal about $ 8000;

for excavation of 9000 square feet to a depth of 1 foot:

excavation and transport about $ 5000-7000, and
disposal about $ 16000.

The total estimated costs of completely deleading a home, then, would be the combined costs of interior/exterior deleading and of soil removal. Assuming EPA regulations continue to allow the identification of lead abatement-related wastes as non-hazardous solid waste, these total costs would be estimated to average from $ 16,000 to $ 31,000 per typical Rhode Island home.

It should be noted that identification of lead abatement-related wastes as hazardous waste by EPA (which has been under consideration for a number of years) would make disposal of such wastes cost-prohibitive.

Project Title and Number: The New England Consortium of Childhood Lead Poisoning Programs, MCJ-443139-05-01

Grantee: Rhode Island Department of Health, Division of Family Health

Total Project Period: From: 10/1/82 To: 12/31/88

Project Director: William H. Hollinshead, M.D., M.P.H.

Persons Responsible for Project Operations: Amy Zimmerman, M.P.H. and
Peter Simon, M.D., M.P.H.

Address of Project Director: Division of Family Health, Rm 302
Rhode Island Department of Heatlh
75 Davis Street,
Providence, RI 02908
401-277-2312

I. **PURPOSE:** The New England Consortium of Childhood Lead Poisoning Programs (NECCLPP) was funded to develop a model of regional collaboration which would initiate new and enhance existing state and local childhood lead poisoning prevention programs. NECCLPP evolved as a result of the fiscal and administrative changes precipitated by the Omnibus Budget Reconciliation Act of 1981. The simultaneous identification of an expanded population of children at risk created a need for innovative management strategies.

II. **GOALS AND OBJECTIVES:** The primary goal of NECCLPP was to assist states in the planning, management and evaluation of childhood lead poisoning prevention programs. In order to meet this the goal the Consortium established 10 objectives. Some of these included: assisting states assess the need for lead poisoning prevention activities; identifving, designing, and providing training and technical assistance; developing guidelines and protocols for needs assessments, program planning, evaluation, and quality assurance; serving as a liason between lead poisoning prevention programs and research initiatives;

fostering the use of new technologies and strategies, and encouraging the development of cost effective regional resources.

III. METHODOLOGY: NECCLPP was organized to execute its mission through a six state Executive Committee; for Task Forces (Data, Laboratory, Medical Education and Community Education) and full time coordinator. The Executive Committee (the states six MCH Directors) was responsible for policy making and program planning decisions. The four task forces addressed individual matters of concern in their respective areas. This enhanced regional networking and identified the experts within the region. Site visits were initially conducted by a NECCLPP team in order to assist each state assess their individual concerns. Technical assistance was provided to each state as needed. States could also apply to NECCLPP for "Special Project" funding to assist with program development.

IV. EVALUATION: NECCLPP's success in meeting its objectives was initially measured in 1985. A survey was mailed to 50 participants to determine if NECCLPP had an impact on lead poisoning prevention initiatives in the region. Respondents noted an increase in both state and local program activities. The areas of screening, case management, community education and environmental investigations showed the most progress. Respondents also noted a general increase in resources available for lead poisoning prevention activities. In 1987, a priorities survey was conducted. Results indicated that NECCLPP's most important activities and functions included: sponsoring annual conferences, developing protocols, fostering new environmental technologies, disseminating information, responding to legislative initiatives and providing inservice education.

V. RESULTS: Over the past six years lead poisoning prevention services in New England have greatly expanded. At the time of inception only 2 states had active lead poisoning prevention programs, one state had sporatic activity and three states had minimal activity. As a direct influence of NECCLPP, several states have initiated new and/or expanded programs. Currently four states have active statewide programs and two states have new initiatives which are resulting in the expansion of services. NECCLPP has also evolved into both a regional and national resource. It has sponsored many professional education opportunities (conferences), disseminated new information and research findings, and monitored and responded to federal policy initiatives.

VI. PUBLICATIONS/PRODUCTS: Numerous products have resulted from this project. Six Annual Regional Conferences were held. Proceedings from three of these conferences were published. The Laboratory Task Force has published two reports. These include New England Public Health Laboratory Testing Services (a pilot study of lowered EP thresholds; 1985), and Collaborative Cost Analysis and Comparative Management Data (cost analysis, workload index study, and Final Recommendations and Conclusions, 1988). Educational materials such as a slide tape show (being converted into a videotape); nutrition, chelation, and renovation brochures; and a poster were produced. Other products of NECCLPP include a model quarterly report form, a comparative analysis of lead poisoning prevention programs (two state evaluation study), a regional lead-in-soil study and an analysis of the prevalence of lead poisoning among in Rhode Island's Southeast Asian community.

VII. DISSEMINATION/UTILIZATION OF RESULTS: The dissemination and distribution of information has occurred continuously throughout the project period. NECCLPP has been able to effectively network both within the region and throughout the nation. This has been achieved via mailings, phone calls, newsletters, conferences and conference proceedings etc. As a result, the NECCLPP mailing list has approximately 1,000 names of individuals from across the country.

VIII. FUTURE PLANS/FOLLOW UP: NECCLPP is investigating strategies which would enable regional lead poisoning prevention activities to be maintained. The Bush Center for Child Development and Social Policy at Yale University is investigating obtaining private foundation funding to maintain regional lead poisoning prevention activities. During the interim, the Rhode Island Department of Health has agreed to maintain some of the networking and dissemination of information.

IX. TYPE/AMOUNT OF SUPPORT AND RESOURCES NEEDED TO REPLICATE: NECCLPP is an easy model to replicate in any region or area where individuals dedicated to the issue are willing to share their expertise. A variety of expertise and a blend of urban and rural areas within a region will enhance the benefit of collaboration. An Executive Committee or Governing Board needs to be created. A full time coordinator with some clerical support is also needed. Additionally, since travel reimbursement is often a limiting factor for individual participants, an adequate travel budget would be recommended. Many of the other resources are available through networking and inkind contributions of agencies and individuals. A moderate but adequate budget for a consortium such as NECCLPP would be $60,000-80,000 per year.

Testimony
United States Senate
Subcommittee on Toxic Substances, Environmental Oversight,
Research and Development
March 8, 1990

Jim Keck
Policy Director, Lead Poisoning Prevention
Baltimore City Health Department

Mr. Chairman, esteemed members of the Senate, I am most grateful for the opportunity to appear before you today. I am even more grateful that these hearings are being held, for it means, perhaps, that the terrible problem of lead poisoning in the United States is finally beginning to receive some of the attention it is due.

Some have called the lead poisoning problem "a silent epidemic." The invisible epidemic might be more appropriate. If the Baltimore City Health Department were suddenly to announce 30,000 cases of measles, the public outcry and demand for action of some sort, of any sort, would be overwhelming. Yet the Health Department has publicly announced that 30,000 of our city's children have suffered permanent brain damage from lead poisoning, and the result has been hardly a whimper of interest.

Why? The reason is that people understand the concept of a communicable disease, such as measles, with its red spots and fevers; they don't understand lead poisoning. Since most poisonings are symptomless and never diagnosed, it is easy to believe that lead poisoning is "someone else's problem."

Lead poisoning, however, is not "someone else's problem." It is our problem.

President Bush has made education a national priority; he has called for the elimination of illiteracy in America. Illiteracy in America will never become a reality, however, so long as tens of thousands of our children are being robbed of their ability to read and write by lead poisoning. For that is precisely what lead does; it attacks the language function of the brain, literally making children less intelligent. This is but one of its awful consequences.

Lead poisoning is also invisible because it is considered a "poor kid's problem". Poor children have so many strikes against them that it is difficult to become aroused by one more problem.

It certainly is true that the poor bear the largest portion of the lead burden, for deteriorating lead-based paint in our low-income housing stock is the greatest single source of lead in the blood of our children.

However, it is a mistake to think that lead-poisoning has boundaries. My office receives reports of dozens of cases of poisonings of middle class children each year. These poisonings most often result from the remodeling or repainting work of private contractors, or even of young, energetic parents remodeling their own older homes. Because of the lack of information and lack of education regarding the hazards of lead, few contractors, and really few people at all, understand that the sanding, scraping or burning of old lead-based paint is extremely hazardous because of the lead dust and fume that is generated in the process; few people understand that children and pregnant women should be nowhere in the vicinity when such activity is taking place.

Recently, in the Baltimore area, one family realized this hazard in the worst of ways, A young, professional couple, with four young children, hired a painting contractor to repaint their front porch. While the painter was in the process of preparing the porch for a fresh coat of paint, the family's pet cat became ill and was diagnosed as lead poisoned. The four children were quickly tested, and three had elevated blood leads, one of which was quite severe. The work was stopped; the painter was fined; but the damage to the brains of the children cannot be repaired. It is permanent.

This is neither an isolated case nor a new phenomenon. What is new is that the problem was diagnosed. Even a few short years ago, their poisoning most likely would have gone unrecognized. The family probably would have wondered in later years, however, after the children had entered school, why those children were having such problems; why they didn't read as well as might have been expected and hoped; why they had difficulty concentrating in school. No one, however, would have suspected lead poisoning at a younger age was the cause.

It is heartening that the federal government has begun to play a larger role in this problem. Much needs to be done.

The federal government can help.

Lead poisoning leads to serious educational deficits in tens of thousands of children each year. We are making little progress in solving the problem because of a serious educational deficit regarding the nature and extent of the problem among the U.S. populace.

The government can assist in the process of educating pediatricians and gynecologists regarding the serious nature of the problem. Many conscientious parents who attempt to follow the advice of the Centers for Disease Control and have their children tested for lead poisoning are greeted with a casual: "Oh, that's not necessary" from their physician.

The government can assist us in educating remodeling contractors and painting contractors of the hazards to themselves, their workers and clients, and the residents of neighboring property if they ignore lead paint as they go about their work.

The government can assist us in helping the numerous communities who claim to have no lead problem to understand that, in fact, what they don't have is an effective lead poisoning screening program. When dealing with a disease that most often has no symptoms, until you look for the problem, you really don't know if you have one or not.

And the government can assist in educating the general public regarding the nature of the hazard and how to protect against it.

Programs in Baltimore and elsewhere have demonstrated that we can perform lead abatements, the act of decontaminating dwelling units and removing or making the lead inaccessible, and we can do it safely. The federal government is now in possession of Guidelines for the safe and effective abatement of lead hazards, developed by the National Institute of Building Sciences and modified by HUD for their specific use. Thankfully, these guidelines will finally be released by HUD on April 1. These guidelines will make it possible to bring a degree of order to the current chaos that exists over proper lead abatement methods.

But while this document provides guidance on how to safely deal with lead paint, it does not tell us how to do it cheaply. Considerable effort is being generated by HUD, EPA, NIOSH and others at the present time to test current and new methodologies and products in an effort to reduce cost. That effort will have to continue beyond the current HUD Demonstration Project, however, in order to make abatement an economically viable alternative, particularly in our low income housing stock. In Baltimore, the cost of lead abatement is often greater than the value of the house being abated. Even with the threat of costly litigation and even costlier settlements of lead poisoning cases, voluntary abatement is not likely to expand greatly so long as this condition persists.

We must find a means of enhancing the value of abated property, and the federal government can assist in this effort as well. Currently, if two identical houses sit side by side, and the owner of one expends perhaps seven or eight thousand dollars to remove the lead, while the other does nothing, the two houses remain identical in value.

Only when a seven thousand dollar expenditure for abatement adds to the resale value of the house accordingly will property owners be willing to make the investment.

Government mortgage insurance programs could require a phased-in series of steps designed to enhance the value of an abated dwelling. Phase-in of such a program could initially require a hazard notification to buyers regarding lead, followed in a later phase by a requirement that such houses be tested for lead; the final phase could be a requirement that property be abated of lead hazards in order to qualify for government mortgage insurance. Such a program, which would cost the government little or nothing, would educate people to the hazards of lead, would soon drive up the value of abated property, and increase the likelihood of voluntary abatements.

In the meantime, however, we must move ahead in the development of primary prevention programs to reduce the number of poisonings until we can rid our residential dwellings and daycare centers of the hazard entirely. It may also be necessary in the interim to have a program of monetary incentives in the form of tax credits, low interest loans, or outright grants. Investment property owners in Baltimore claim that the cost of lead abatement will lead to wholesale abandonment of low income rental property. We have not seen such a response as yet, but neither can we afford to sit and wait to see if it will happen. Abandonment of property quickly results in massive deterioration of structural, electrical and mechanical systems, making the cost of renovation intolerably high. Loss of significant numbers of low income housing units will surely lead to increased homelessness and increased hopelessness among our low-income citizens.

Therefore, it is time to move ahead and move ahead rapidly. We have a unique opportunity with this particular public health problem, an opportunity that is rare in problems of this magnitude.

We understand the nature of this problem, we understand the source of the problem, and we have the knowledge of how to prevent this problem. We need only develop the will, as a nation, to move ahead. By preventing lead poisoning, not only will we be saving our children, our nation's greatest resource, but we will save enormous sums of money in medical costs, special education costs, and all the many costs associated with society's support of and care for those who drop out of school.

Once again, I wish to thank you for these hearings as one small step in the right direction. I urge now that we quicken our pace and move ahead forcefully.

STATEMENT OF JEFFREY L. ZELMS
PRESIDENT, THE DOE RUN COMPANY

BEFORE THE
SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

March 8, 1990

Mr. Chairman and Members of the Committee, my name is Jeffrey L. Zelms. I am President of the Doe Run Company, a producer of lead and other metals. I am also Chairman of Lead Industries Association, Inc., a trade association whose members are producers and commercial consumers of lead. With me is Mr. Robert J. Muth, Vice President - Government and Public Affairs, ASARCO Incorporated, which is also a producer of lead and other metals and a member of LIA.

We welcome the opportunity to appear before the Committee and contribute to the discussion -- and, we hope, the solution -- of the problems caused by the flaking and peeling of lead paint in poorly maintained older housing. The use of lead in interior house paint was discontinued nearly 35 years ago partly as a result of LIA's efforts. We have actively tried over the intervening years to enhance public awareness of the health problems, particularly those affecting children, caused when leaded paint is allowed to deteriorate, and to encourage Congress to take action to solve those problems. We are here to do so today.

Old, peeling lead paint in buildings which have been neglected is one of two public health problems associated with discontinued uses of lead. The other is the use of lead pipes and lead solder for drinking water service lines and household plumbing. Unlike the problem of lead paint in housing, which has proved difficult to grapple with, a solution to problems caused by lead in pipes and solder is readily at hand. The solution involves EPA action requiring public drinking water systems to adopt a treatment technique for corrosivity, as Mr. Muth will explain in his testimony.

We think it is important to recognize that while past production and some past uses of lead involved significant public exposure, that situation does not exist today. Three factors explain this. First, lead uses involving public exposure have been discontinued or minimized. Second, most lead produced in the United States is recycled. Third, lead production and use are subject to comprehensive Federal regulation.

I also want to make the point that the lead we produce today is used in products, such as the lead acid battery, that are essential to our economy. There is no satisfactory substitute for lead in these products.

Mr. Muth's testimony will cover the points concerning Federal regulation of lead and will show that the public's exposure to lead has been reduced to a minimum with a resulting sharp decline in blood lead levels throughout the nation. The remainder of my statement will be devoted to the lead paint issue and to current uses of lead.

Lead Paint in Older Housing

Leaded paint was first used long before the 20th century. Paint containing lead was popular for use in interior housing early in this century, but sales diminished greatly after World War II, and in 1955 industry voluntarily discontinued the product. LIA, which was formed in 1928 and soon after began working with Harvard Medical School on lead health research projects, was among those urging that such use be discontinued. Long before that, in the 1930's, LIA recommended that lead paint not be used on children's toys and furniture, and this practice was discontinued. In the 1950's, LIA supported the development of community blood lead screening programs. The Association has also long been active in promoting such programs and in publishing and distributing pamphlets and audio-visual materials providing parents information on screening programs.

In 1972, LIA testified in support of the proposed Federal Lead Based Paint Prevention Act. In 1988 and 1989, the Association participated with the National Institute of Building Sciences in a congressionally sponsored lead paint research project for the Department of Housing and Urban Development. The objective of the project has been to develop guidelines for evaluating existing lead paint sites and for cost-effective techniques for treating or removing lead based paint in housing, particularly in HUD public housing projects. HUD is scheduled to release these guidelines at the end of this month.

The publication of the guidelines should point the way to more effective programs for reducing or eliminating risks posed by lead based paint in housing. LIA is ready to assist in the development of those programs in cooperation with Federal, State and local authorities.

Current Uses of Lead

In addition to the fact that lead may no longer be used in interior housing paint, drinking water service lines or household plumbing solder, other uses involving public exposure to lead have largely been terminated. The most notable of these are the use of lead in gasoline and in the solder in food cans. Because of the special properties of lead -- its density, malleability and resistance to corrosion -- other uses for the metal have been found in high technology and other products that play an important role in the U.S. economy. These new uses all involve little public exposure to lead. Because of these new uses, U.S. lead production has been increasing modestly. Measured in tons of production, lead remains the fifth most important metal in use in the United States.

Some of the major current uses of lead are as follows:

Automobile and Industrial Storage Batteries. Because of its special chemical properties, lead is the principal component of automobile and industrial storage batteries. Approximately 78 percent of the lead produced in the United States is used in lead-acid batteries, at least 90 percent of which are recycled. In addition to their use in automobiles and trucks, lead-acid batteries provide standby power for hospitals, military installations and a variety of governmental and industrial facilities. Also, an increasing number of governmental regulations call for the use of battery-powered forklifts, mine locomotives, coal scoops and other types of industrial vehicles for the purpose of reducing worker exposure to noxious fumes. Most recently, GM has announced the development of an automobile powered by lead-acid batteries that could greatly reduce fossil fuel emissions. I should point out that an EPA-sponsored report by ICF, Incorporated entitled "Use and Substitutes Analysis for Lead and Cadmium Products in Municipal Solid Waste" issued in September 1989 examines potential substitutes for lead and concludes that there is no satisfactory substitute for lead in automotive batteries and in a number of other uses.

Radiation Shielding. The Nuclear Regulatory Commission has stated that lead represents "the best practical gamma shield material," and lead is used by government and industry far more than any other material for that purpose. Leaded glass provides a radiation barrier for the face plates of television sets, computer screens and other video display terminals. In medical applications, lead shielding is required for the safe use of X-rays, and in the use of radiation therapy in the treatment of intractable disease.

High Technology Applications. The electronics industry has generated demand for increased miniaturization of computer components and electronic circuits. The resulting requirement for high density circuitry has led to major advances in mass soldering techniques. Lead alloy solder is the solder of preference in uses ranging from inter-connecting the transistors, relays and other components attached to printed circuit boards to providing continuity for electrical systems in missiles and satellites. In the field of electroceramics, lead is used as a constituent of computer stable memory chips that represent a major technological breakthrough because of their ability to retain data even when power is shut off.

There are numerous other current uses of lead -- for example, to provide a sound shield in aircraft and as an anti-corrosive sheathing material for underground electrical cable -- and these are listed in the accompanying booklet.

Future Uses of Lead

In addition to GM's experimental battery-powered automobile, there are a number of potential new uses for lead, some of which promise important environmental benefits. Working with the Electric Power Research Institute, the International

Lead Zinc Research Organization is examining the cost-effectiveness of a giant lead acid load levelling battery which could provide standby power during periods of peak electrical use and eliminate the need to keep generators operating on so-called spinning reserve in order to meet peak needs. Load levelling batteries could reduce the amount of fossil fuel needed to generate electrical power and thereby lessen air emissions of such pollutants as hydrocarbons, nitrogen oxides and sulfur dioxide.

A new sheet lead radon barrier system has been developed to reduce the hazards posed by radon. If it proves effective and commercially viable in new homes, a retrofit system will be developed for existing homes. Since radon in the environment is considered to be a leading cause of cancer deaths, the success of this experiment would provide important health benefits.

Extensive research has been done in Israel on a power generator, called ETGAR 3, capable of creating electrical energy directly from molten lead. A demonstration program is now underway.

Finally, the Japanese have begun to use lead in building foundations to absorb earthquake shock. We believe it is only a matter of time before this technique is used in the United States as well.

Conclusion

We support governmental efforts to address deteriorating paint in older housing and the leaching of lead from the lines and plumbing that deliver drinking water supplies. We also believe it is important that Congress recognize that lead plays a valuable role in the U.S. economy and that many new uses of lead will provide economic and environmental benefits. Congress also should understand that public exposure to lead from current production and uses does not pose a significant health risk, as Mr. Muth will now explain.

Lead Industries Association, Inc.
292 Madison Avenue • New York, N.Y. 10017 • Telephone: (212) 578-4750

April 27, 1990

Senator Harry Reid, Chairman
Subcommittee on Toxic Substances,
Environmental Oversight, Research and Development
United States Senate
Committee on Environment and Public Works
Washington, DC 20510-6175

Dear Senator Reid:

Thank you for your letter of March 22, 1990, requesting that The Doe Run Company and Lead Industries Association, Inc. (LIA), answer a series of questions relating to the March 8 hearings before your Subcommittee on the effects of lead exposure on children. We are preparing answers to those questions and will send them to you shortly. In the meantime, I would like to respond to other issues that were raised during the hearings.

First, during the course of her testimony, Dr. Ellen Silbergeld stated that LIA played a role in the 1920s in preventing U.S. ratification of an International Labour Organization (ILO) convention opposing the use of lead chemicals in paint. The facts are otherwise.

According to a report by the International Labour Office, ILO in 1921 recommended banning the use of white lead and sulphate of lead in the interior painting of buildings; but the reason for the recommendation was concern over the health of painters, not children.[1] Painters in those days generally mixed dry lead pigments in oil to make paint; the ILO action was prompted by concern over the effects of conducting the mixing in confined spaces. Our research has disclosed that the proposed convention against the use of white lead and sulphate of lead in paint was opposed by the International Association of Master House Painters and Decorators of the United States and Canada on the grounds that "any general prohibition of the use of white lead in painting would result in less permanent and satisfactory work being done..."[2] However, LIA was not formed until 1928 and so far as we can determine had no role in the ILO matter. Nor have we uncovered any evidence that ratification of the convention was considered by the United States, which was not represented at the ILO conference on the proposed convention and was not a member of ILO.

I might point out, as I did at the March 8 hearing, that in 1972 LIA testified before Congress in support of the proposed Federal Lead Based Paint Prevention Act.

Second, regarding the proposal of the Environmental Defense Fund that a tax of $1.25 per pound (equal to more than three times the current price of lead) be imposed on primary lead, with the avowed ultimate purpose of driving the industry out of business, Dr. Silbergeld alleged that the tax would help compensate for the depletion allowance which, she contended, affords primary smelters an unfair advantage over secondary recyclers of lead. Dr. Silbergeld's theory was that the tax would eliminate that advantage and thus encourage greater recycling.

We know of no support for the proposition that primary smelters enjoy a cost advantage over secondary smelters, a[illegible] noteworthy that our company, which operates a primary smelter, is taking [illegible] engage in secondary smelting. Furthermore, a 1988 report by the Bureau of Mines concluded that the cost per pound of lead produced by primary lead smelters was 23.8 cents in 1987, the study year, compared with 23.1 cents for secondary smelters, a margin which favored the secondaries.[3]

Third, you asked about the potential environmental impact of lead-stabilized asphalt, which is being tested by LIA for potential use on roadways; and I stated that the product was being subjected to extensive environmental testing before being marketed. In fact, an environmental analysis of lead-stabilized asphalt has been underway for several years. The results thus far are as follows:

Leachate. Sample cores from an asphalt test strip were collected at one site in early 1985. Leachate tests were conducted on the material. Lead extraction was negligible, ranging from below detection to between 0.004 mg/l and 0.008 mg/l. The current drinking water standard for lead is 0.05 mg/l Pb, far above these leachate extraction values.

Air Quality. Air quality modeling was done for lead-stabilized roads by developing emission rates based on road wear statistics. The maximum predicted air lead concentration was one percent of the current National Ambient Air Quality Standard for lead.

Water Quality. Surface water transport modeling, assuming worst case conditions and using an SCS hypothetical model, revealed nearly zero lead concentrations. The highest predicted lead concentration in runoff was 0.000031 mg/l lead, compared to a federal guideline of 0.05 mg/l and the proposed 0.005 mg/l lead drinking water standard.

Workplace Exposure. Occupational exposure of asphalt plant workers and application workers did not exceed the levels of exposure experienced by workers handling asphalt without the lead stabilizer additive.

While the foregoing tests indicated that no environmental threat was posed by the lead-asphalt stabilizers, additional tests were conducted that confirmed the earlier ones.

Fourth, at the hearing you asked how tetraethyl lead acts to increase the octane rating of gasoline. Octane is a rough measure of the ability of gasoline. Octane is a rough measure of the ability of gasoline to produce power without causing an engine to rattle or knock; the higher the octane, the less the knock. In the absence of tetraethyl lead, gasoline tends to ignite or explode prematurely in a chamber as compression increases and thus causes the engine to rattle or "knock." Though there is no clear-cut scientific explanation as to why this is so, tetraethyl lead enables gasoline to burn more smoothly and evenly. This eliminates knock, enables the engine to run at a higher compression ratio than is possible with gasoline that does not contain tetraethyl lead, and thus increases the octane rating.

Fifth, you also asked what advantages were provided by the use of lead chemicals in paint. The use of chemicals such as basic lead carbonate, basic carbonate white lead, and white lead provides hiding power, brightness, and paint consistency.[4] In addition, when lead carbonate is mixed with oil it produces a glossy, dense film that increases the paint's longevity and beauty.

Should you have additional questions, please do not hesitate to contact the Lead Industries Association or myself at The Doe Run Company offices in St. Louis. Our address is Suite 400, 11885 Lackland Road, St. Louis, Missouri 63146-4236.

Sincerely,

Jeffrey L. Zelms

JLZ/llm

NOTES

1. White Lead, a publication of the International Labour Office (Geneva, 1927).

2. Id at 35.

3. "Impact of Existing and Proposed Regulations on the Domestic Lead Industry," pp 22-23 (U.S. Department of Interior, OFR 55-88 (1988).

4. Pigment Handbook, p. 69 (John Wiley & Sons).

THE
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JEFFREY L. ZELMS
[illegible]
[illegible]

June 1, 1990

Senator Harry Reid, Chairman
Subcommittee on Toxic Substances,
Environmental Oversight, Research and Development
United States Senate
Committee on Environment and Public Works
Washington, DC 20510-6175

Dear Senator Reid:

I appreciated the opportunity to testify before your subcommittee on March 8, 1990; and I am happy to address the individual questions you raised in your letter of March 22. All responses are on behalf of Doe Run.

Question:
The EDF has suggested that a tax be placed on new lead. Would you like to respond to this proposal?

Answer:
The EDF's excise as proposed is unacceptable to the industry. Their focus on new lead production is misplaced when attempting to address the issue of cleanup of lead painted dwellings. To direct the total burden for cleanup of such problems on the remaining two primary producers in the United States is inappropriate. It is our belief that EDF's initiative is a very thinly veiled effort to divide and conquer the primary and secondary lead producers and further force the elimination of primary production. It is inconceivable to assign an excise of three times the current market value of the product.

As I believe you know, our company has voluntarily been involved in recent discussions with the EPA and other major members of the lead producing/consuming industry.

The issue as explained by Dr. Needleman and Dr. Silbergeld is old deteriorating lead-pigmented paint in dwellings. Today's lead production by our company poses manageable environmental risks and no significant health hazards.

Question:
Do you believe that the United States' demand for lead could be met through greater recycling?

Answer:
The U.S. demand for lead cannot be met by greater recycling nor is this an appropriate goal for legislation or regulatory actions. The major reasons for this are:

A) The deficit between U.S. lead consumption and lead currently being recycled is between 400,000 and 500,000 metric tons. In 1989, consumption was 1.23 million metric tons and lead produced from recycling was 790,000 metric tons leaving a deficit of 440,000 metric tons.

U.S. Lead Demand Deficit

U.S. lead demand deficit for the last ten years is shown in Figure 1. The deficit between lead currently being recycled and consumption ranges between 400,000 metric tons and 500,000 metric tons. This shortfall has been made up of primary lead production and imports (Figures 1, 2, 3 and 4).

B) Several lead applications do not yield to easy recycling. These applications are lead crystal, television tubes, computer screens, x-ray glass shielding, etc. The lead is extremely tightly bound, does not leach or precipitate out and technically cannot be separated.

Recycling Rates

Spent automotive batteries are the largest source of feed for recycling, accounting for 83.6 percent of total feed to U.S. recycling facilities in 1989. Recent calculations by the Department of Commerce-U.S. Bureau of Mines and Doe Run indicate that recycling rates for 1988 and 1989 were in the range of 95 to 99 percent of available automotive batteries. (See Figures 5 and 6.)

The high rates for recycling in 1988 and 1989 reflect previously accumulated spent automotive batteries coming into the recycling stream. In the early 1980's recycling rates were lower than today probably on the order of 85 to 90 percent reflecting low lead prices and subsequently low spent automotive battery prices.

These batteries which failed in the mid 80's were accumulated and saved and it appears came back into the recycling stream in 1987, 1988 and 1989 when the price for spent automotive batteries improved from 3 to 4 cents per pound to 6 to 7 cents per pound.

In an EPA sponsored study, these uncollected batteries have been "assumed" to go into municipal landfills. It now appears that a substantial portion of these spent batteries "sat" around awaiting favorable prices and then were returned to smelters for recycling.

At a 95 percent recycling rate, approximately 35,000 metric tons of lead in spent automotive batteries would not be recycled. At a 90 percent recycling rate, about 73,000 metric tons of lead in batteries would not be recycled. At a 100 percent recycling rate, neither of these recycling rates would fill the current deficit of over 400,000 metric tons between recycled lead available and U.S. demand.

C) Lead is already being recycled at very high rates. Battery recycling exceeds 90 percent and could exceed 95 percent. One hundred percent recycling would not make up the deficit. One hundred percent recycling would provide an additional 35,000 to 75,000 tons leaving a deficit of nearly 400,000 tons between U.S. lead consumption and lead available from 100 percent recycling.

Recyclability of Lead Products

Figures 7, 8 and 9 detail lead consumption and relative recycling rates. Most uses of lead are currently recycled. Exceptions are:

Lead Chemicals - Lead used in glass, TV tubes, computer screens, as a stabilizer for plastics, as an ingredient in lead vinyls for x-ray shielding, sound proofing, etc.

Lead Solders - Although potentially recyclable lead in solder is usually a small portion of the product. Typical examples are light bulbs, portable radios, VCRs, etc.

Specialty Batteries - Flashlight-sized sealed lead-acid batteries used to power portable TVs, flashlights, etc.

By far, the vast majority of lead used in the U.S. is recycled. (Lead enjoys the highest recycling rate of any major industrial metal.)

D) Certain applications require 99.99 percent lead which today is not available from recycled sources. These applications include stand-by (emergency) batteries, submarine batteries, particle physics research, nuclear shielding, etc.

Lead Quality

Lead from recycled sources is usually 99.985 percent pure. Lead from certain primary producers (those using high purity ores from Missouri) is usually 99.99+ percent.

Certain applications require high purity (99.99+ percent) lead. Other applications specify high purity lead. Very small amounts of impurity elements (parts per million or billion) can cause lead-acid batteries to generate hydrogen and oxygen gas and lose water. Stand-by batteries used for emergency lighting, as hospital emergency room back-up during power failures, as telephone system back up, etc., cannot generate hydrogen due to the chance that a spark will ignite the hydrogen, causing a major explosion. Submarine batteries also require 99.99+ percent lead for the same reasons.

For automotive batteries, 99.99+% lead is used in the manufacture of original equipment batteries to minimize water loss and assure that the batteries are "maintenance-free". The critical uses are summarized in Figure 10.

E) Lead is produced in conjunction with other metals. In the United States, zinc and silver are commonly mined with lead. In the world, most mined lead is a by-product or co-product of zinc and silver production, i.e., the ore body mined for zinc or silver and lead is recovered as a by-product. Thus in many cases, lead would still be mined even if it had little or no commercial value. In other cases, the loss of economic value in lead would result in shutting down mine production of zinc and silver.

Primary Lead As A By-Product

Primary lead is a by-product of lead mining. According to the United States Bureau of Mines, in the U.S. 66 percent of zinc produced, 31 percent of silver produced and 5 percent of copper produced are associated with primary lead production. In 1991, Cominco Inc.'s Red Dog Mine will be fully operational, producing over 300,000 tons of zinc and 95,000 tons of lead.

According to the United States Bureau of Mines, elimination of primary lead would mean that the U.S. would produce significantly less zinc, and significantly less silver and copper. These metals would have to be imported. The economic impact of lost jobs, lost revenue from lost zinc, silver, etc., production would be several billion dollars (See Figure 11).

F) Recycled lead is less expensive than primary lead. With current recycling economics and initiatives, a battery producer can collect batteries and have these batteries converted to lead metal at a recycling facility for 32 cents per pound today (April 20, 1990). The price for primary lead on an equivalent basis would be 40 to 42 cents per pound.

Battery producers have a very strong economic incentive to recycle batteries and use recycled lead. Primary lead and imported lead are sold as a last resort.

Economics of Recycling

Battery producers collect spent batteries as part of the sale of new batteries. The reasons for this are that collecting spent batteries is economically favorable, is good environmental practice and, in some states, is encouraged by legislation.

The economics of battery collection are:

	WEEK OF APRIL 16, 1990	DECEMBER, 1989
SPENT BATTERY PRICE (50% LEAD)	$.07/LB	$.05/LB
LEAD CONTAINED PRICE	$.14/LB	$.10/LB
CONVERSION CHARGE TO LEAD	$.17/LB	$.17/LB
FREIGHT FROM RECYCLER	$.01/LB	$.01/LB
DELIVERED PRICE TO CONSUMER	$.32/LB	$.28/LB
PRIMARY LEAD MARKET PRICE	$.42/LB	$.35/LB

A battery producer will save 10 cents per pound today to recycle and convert his spent battery into lead.

At lower levels, the strong economic incentive still exists to convert spent batteries into lead. In December, at lower levels, it was still much more profitable to convert spent batteries into lead rather than buy virgin material.

The break-even price under current conversion charges appears to be 25 cents per pound lead price and a 3.5 cents per pound spent battery price.

Question:
What steps have you taken to protect the workers in your smelters?

Answer:
There are a series of steps that have been taken by our company and the other companies in our industry going back over a number of decades in response to new information about lead.

A) Engineering Controls - Process changes or ventilation has been instituted where possible to control or eliminate lead bearing dust. Plants have been paved and are watered and swept to keep dust from blowing. Control rooms and other work areas have been sealed and clean room ventilation installed where appropriate.

B) Hygiene - New double-sided changehouses/shower rooms have been built to prevent lead from being carried out of the work place. Employees change company provided clothes at least daily and laundering is done by the company. No food or smoking is allowed in the workplace and a new air pressurized cafeteria and breakrooms have been provided. Each employee is educated extensively about the health concerns of lead and they are partners in the program. Respirators are provided for every employee and are cleaned daily. Housekeeping programs are continually enhanced.

C) Medical Programs - Employees get regular monitoring of their blood lead levels, and anyone who gets above OSHA standards of 50 ug/dl (and in many cases more stringent company standards) is removed for a time to a low lead area to allow a return to a lower level. Today there are very few employees that need this protection in the industry. Each employee gets a complete medical examination annually, or more frequently if required. I have attached a graph (See Figure 12) from Doe Run (which is typical of the industry) which shows a halving of the blood lead level since 1980 and which is continuing to fall. To my knowledge, all of the major producing and using companies in the lead industry has achieved the blood lead target distribution goals set out by OSHA standard in the mid 1970s.

No employee beginning to work in the lead or battery production industry today should experience any lead related health problems because of the rigorous education and monitoring systems in place.

Question:
Why are so many of your smelters not in compliance with the guidelines set by EPA?

Answer:
There are dozens of EPA guidelines for water, air, and solid wastes; and the industry is in compliance with most of these. I am sure you are referring to ambient air lead levels around smelters.

When the EPA administrator, Douglas Costle, set the ambient air standard in 1978, he stated that he was setting a standard that would be difficult if not impossible for the smelters to meet. Considering that about half of the dust in a smelter is lead, the lead standard is about 20 times more stringent than the corresponding particulate standard to meet. Nonetheless, my company and most others have worked diligently to install equipment and change administrative procedures to attempt to meet this standard. At our smelter since 1972, we have reduced our emissions to one quarter of what they were and have just signed an agreement with the State of Missouri to install equipment designed to cut the emissions in half again and are projected to meet the ambient air lead standard.

I am aware of many other similar situations where plants are getting very close to compliance with this very stringent standard. Apparently there are only eight areas around point sources where monitored data shows the standard in 1989 has been exceeded.

Nonetheless, the industry is looking at the available blood lead data for children\around smelters, and the preliminary indication is that the blood lead goals for children established in the 1978 standard are being met. Around our own smelter blood lead levels of children are about half of what they were in 1975.

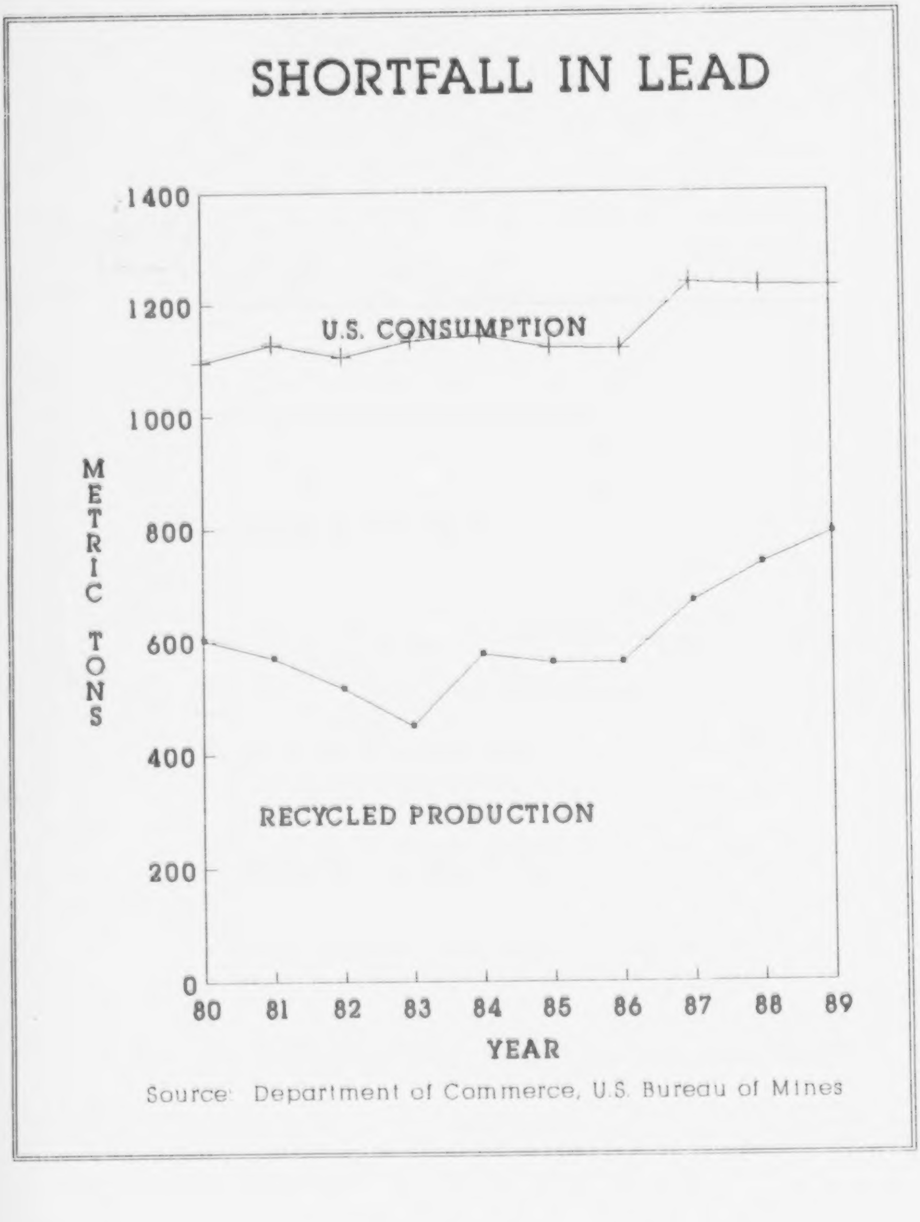
Sincerely,

Jeffrey L. Zelms

Jeffrey L. Zelms

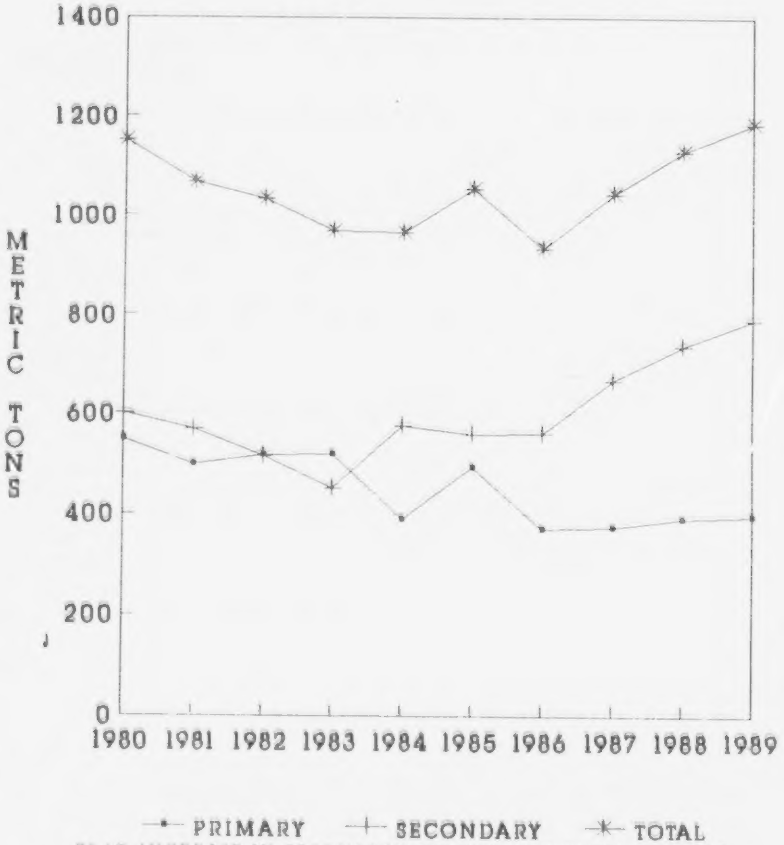
JLZ/llm
Enclosures

Figure 1



Source: Department of Commerce, U.S. Bureau of Mines

Figure 2



U.S. LEAD PRODUCTION

75.6% INCREASE IN SECONDARY PRODUCTION FROM 1983-1989 (12.6%/YR)
23.6% DECLINE IN PRIMARY PRODUCTION FROM 1983-1989 (3.9%/YR)

Figure 3

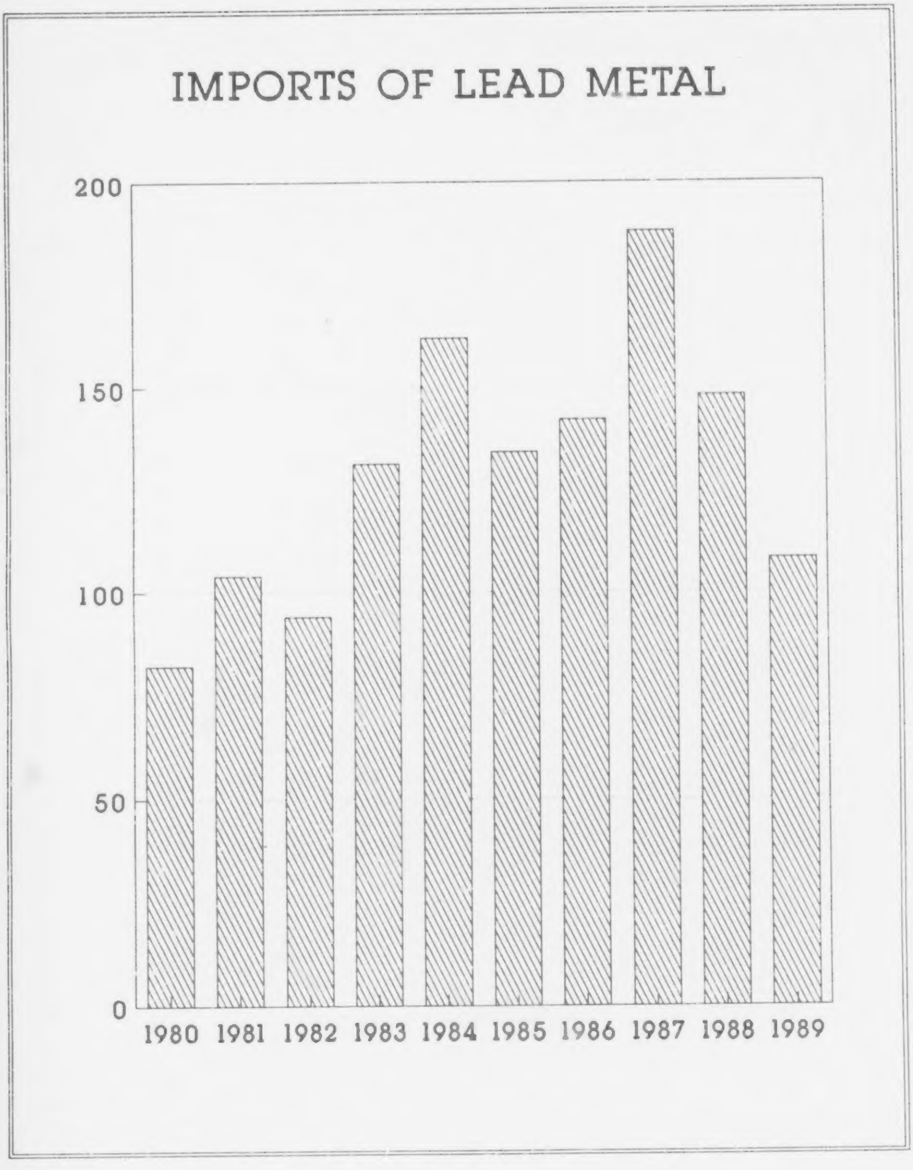

IMPORTS OF LEAD METAL
200
150
100
50
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

Figure 4

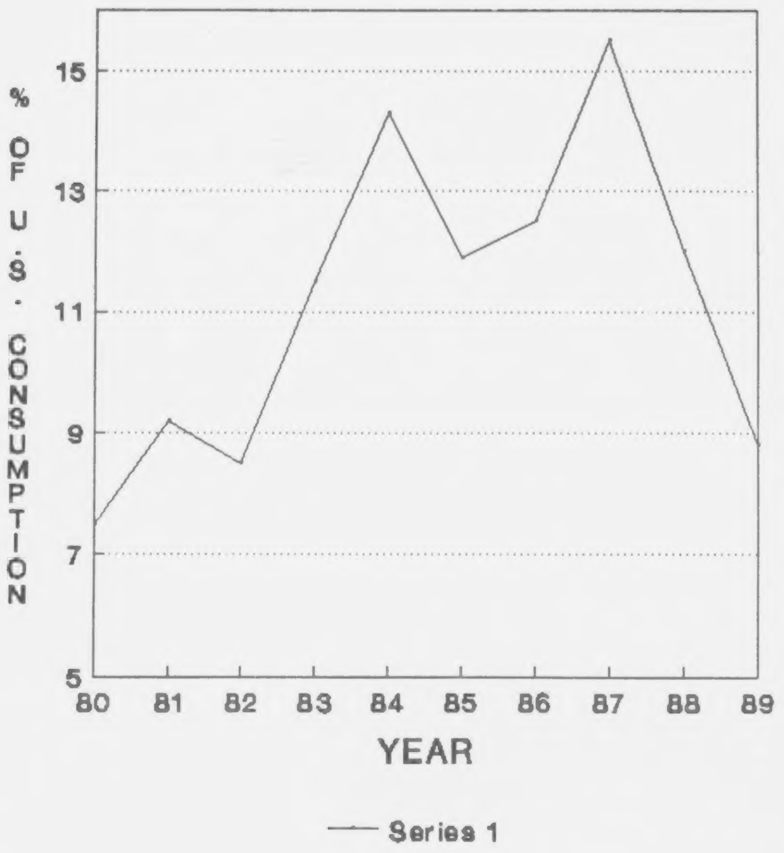

% OF U.S. CONSUMPTION
15
13
11
9
7
5
80
81
82
83
84
85
86
87
88
89
YEAR
Series 1

Figure 5

RECYCLING RATE

		BUREAU OF MINES	DOE RUN
LEAD IN BATTERIES REC'D @ SECONDARY SMELTERS	1988	623,000 MT	
	1989	660,000 MT	
	TOTAL	1,283,000 MT	1,283,000 MT
INDUSTRIAL BATTERIES REC'D		10%	50,000 MT/YR
REC'D WT OF SLI UNITS		1,154,700 MT	1,183,000 MT
PROCESS LOSS		2%	
	TOTAL	1,178,265 MT	1,183,000 MT
WEIGHT PER SLI UNIT		19 LBS	17,79 LBS*
UNITS RECYCLED IN TWO YEARS		136,700,000	146,603,000
AVERAGE/YR		68.5 M	73.3 M

*JCI SURVEY

Figure 6

SUPPLY POTENTIAL

	BUREAU OF MINES*		DOE RUN**		
	1984	1985	1984	1985	1986
U.S. SLI SHIPMENTS	72.1	72.2	72.1	72.2	75.2
BATTERY IMPORTS (SLI)			1.0	1.6	1.8
FOREIGN VEHICLES	3.0	3.0	3.0	3.0	3.0
SCRAP BATTERY EXP.	-3.1	-4.2	-3.1	-4.2	-4.0
	72.0	71.0	73.0	72.6	76.0
AVERAGE POTENTIAL SUPPLY	71.5			73.9	
	$\frac{68.4}{71.5}$			$\frac{73.3}{73.9}$	
RECYCLE RATE	95.7%			99.2%	

*ASSUMED 4 YEAR BATTERY LIFE

**ASSUMED 3.5 YEAR BATTERY LIFE

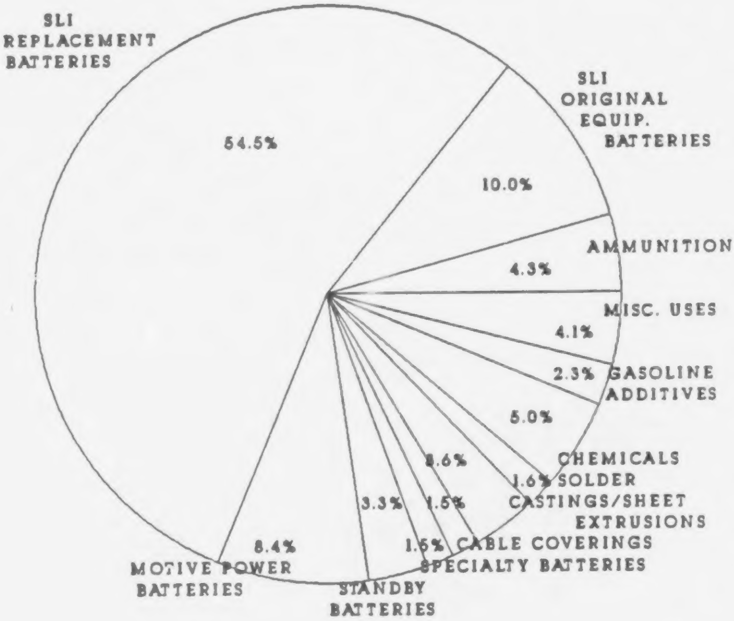
Figure 7

U.S. LEAD CONSUMPTION

(1988)

	CONSUMPTION (MT)	% OF TOTAL
AMMUNITION	52,708	4.3
STARTING, LIGHTING IGNITION BATTERIES	793,784	64.5
ORIGINAL EQUIP	123,502	10.0
REPLACEMENT	670,282	54.5
INDUSTRIAL BATTERIES	143,479	11.7
MOTIVE POWER (FORK LIFT)	103,305	8.4
STAND BY	40,174	3.3
SPECIALTY BATTERIES	18,000	1.5
CABLE COVERING	17,788	1.5
CASTINGS/SHEET/ EXTRUSIONS	44,480	3.6
SOLDER	19,064	1.6
CHEMICALS	62,524	5.0
GASOLINE ADDITIVES	28,000	2.3
MISC. USES	50,905	4.1
	1,230,732	100.1

Figure 8



U.S. LEAD CONSUMPTION

1988

Figure 9

LEAD PRODUCTS & RECYCLING

	EASILY RECYCLED?	1988 U.S. CONSUMPTION (MT)	CURRENT RECYCLING RATE
AMMUNITION	YES	52,708	RANGE AMMO-HIGH
ANODES	YES	LESS THAN 5,000	HIGH
AUTOMOTIVE BATTERIES	YES	793,784	HIGH
INDUSTRIAL BATTERIES	YES	143,479	HIGH
SPECIALTY BATTERIES	YES	18,000	LOW
BEARINGS	YES	LESS THAN 5,000	HIGH*
BRASS/BRONZE	YES		HIGH*
CABLE COVERING	YES	17,788	HIGH
CASTINGS	YES	44,480	HIGH
LEAD SHEET	YES		HIGH
EXTRUSIONS	YES		HIGH
HOSE CURING	YES	LESS THAN 5,000	HIGH
LEAD POWDER	NO	LESS THAN 5,000	LOW
CHEMICALS	NO	62,524	LOW
SOLDER	YES	19,064	?
TERNE METAL	YES	LESS THAN 5,000	HIGH*

*RECYCLED FOR RECOVERY OF OTHER ELEMENTS

Figure 10

USES FOR WHICH 99.99% LEAD IS SPECIFIED/NEEDED

		USE OF 99.99+% LEAD
ORIGINAL EQUIPMENT AUTOMOTIVE	110,000 MT	SPECIFIED
STAND-BY BATTERIES	40,174 MT	CRITICAL
SPECIALTY BATTERIES	18,000 MT	CRITICAL
LEAD CHEMICALS	45,000 MT	CRITICAL
SUBMARINE BATTERIES		CRITICAL**
SHAPED CHARGES		CRITICAL
PARTICLE PHYSICS		CRITICAL
HOSE CURING		SPECIFIED
ELECTRONIC SOLDER	10,000 MT	SPECIFIED

*TELEPHONE, UPS, EMERGENCY LIGHTING

**CAUSE OF FIRES/EXPLOSIONS ON SUBMARINES

Figure 11

IF PRIMARY LEAD IS BANNED IN THE U.S., THE FOLLOWING PRODUCTION WILL BE AFFECTED:

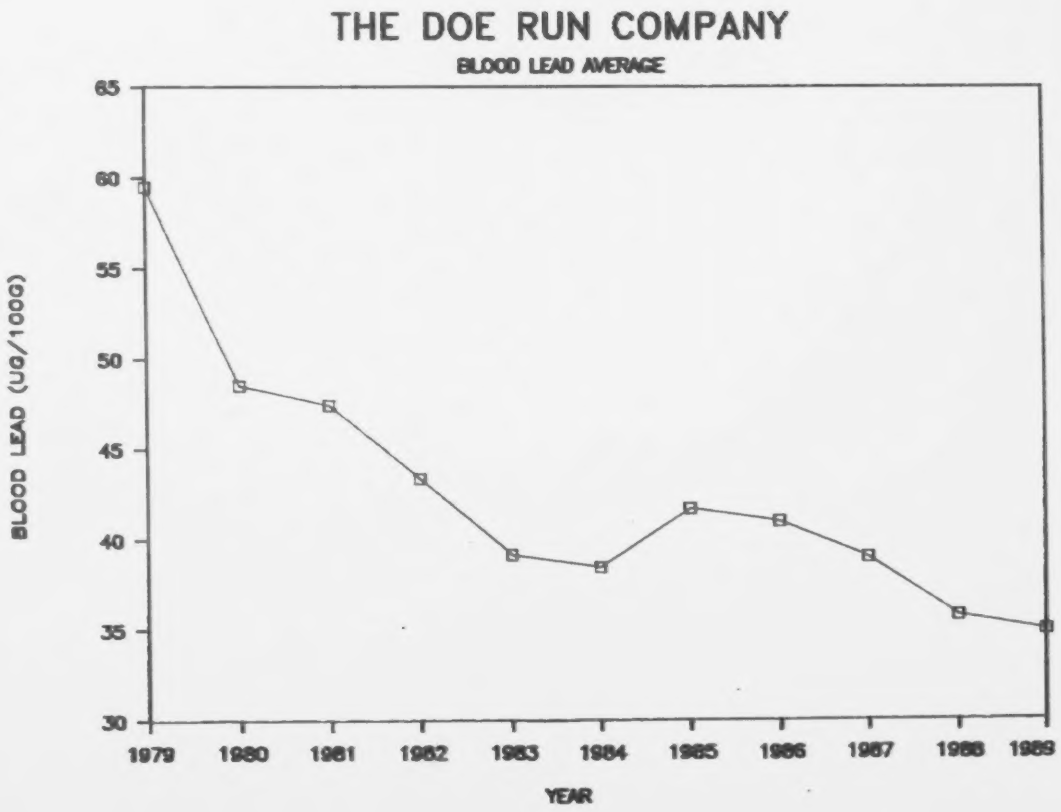
	% OF MINE PRODUCTION AFFECTED	VOLUME (MT)	ANNUAL ECONOMIC IMPACT*
ZINC	23%	60,000	$117. MILLION
FLUORSPAR	98%		
GERMANIUM	35%		
SILVER	31%	515	$ 82.9 MILLION
COPPER	5%	71,000	$187.8 MILLION

IN 1991, AS A RESULT OF FULL PRODUCTION AT COMINCO'S RED DOG MINE, ZINC WILL BECOME:

ZINC	66%	400,000	$ 700.0 MILLION

*ECONOMIC IMPACT IS THE VALUE OF THE PRODUCT ONLY. TRICKLE DOWN ECONOMIC IMPACT WOULD EASILY DOUBLE.

Figure 12


THE DOE RUN COMPANY
BLOOD LEAD AVERAGE
BLOOD LEAD (UG/100G)
65
60
55
50
45
40
35
30
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
YEAR

Lead Industries Association, Inc.
295 Madison Avenue • New York, N.Y. 10017 • Tel (212) 578-4750 • Fax (212) 684-7714

June 7, 1990

Senator Harry Reid, Chairman
Subcommittee on Toxic Substances,
Environmental Oversight, Research and Development
United States Senate
Committee on Environment and Public Works
Washington, DC 20510-6175

Dear Senator Reid:

This letter responds to the questions relating to your Committee's March 8 hearing on the long term health effects of lead exposure that were directed to the Lead Industries Association (LIA) in your letter to me dated March 22, 1990.

You have asked LIA to answer three questions. The first and third involve essentially the same issue -- whether and to what extent the lead industry might contribute to the costs of paint abatement in homes containing lead-based paint. You point out that the pendency of lawsuits against individual companies might affect LIA's willingness to comment on this matter. In fact, several lawsuits have been brought against LIA concerning lead paint in housing in which either damages or abatement costs are being sought. Because of those lawsuits, we believe LIA should not respond to questions one and three.

The second question notes that the public is aware of the use of lead in lead-acid batteries, and asks about other uses for lead of which the general population may not be aware. That question also asks whether substitutes are available for lead in these other products.

Lead has a combination of properties -- the principal ones are high density, high opacity to gamma and X-ray energy, low sound conductance, a low melting point, exceptional malleability, high corrosion resistance, stability, and special electrical properties -- that have resulted in its being used in a long list of products that play an important role in our economy. Before outlining the major products that use lead, I should point out that, as we have advised your staff, LIA and two other associations, Battery Council International and the Secondary Lead Smelter Association, are cooperating with the Environmental Protection Agency in a study of lead production, disposal and uses which will examine the reasons for the use of lead in products. LIA's members include only a small fraction of the industrial consumers of lead who can best explain why lead is a necessary constituent of their products, and we are arranging meetings over the next six weeks between EPA representatives and representatives of these industrial consumers at which time the reasons for using lead and the question of whether or not satisfactory substitutes exist in particular applications will be discussed in detail. This information will add substantially to what we are able to provide you today, and will be transmitted to you and your staff as it is developed.

Some of the major uses of lead are set forth below. Note that the discussion is confined to lead's special properties and does not take into account any cost advantages lead may enjoy over potential substitutes or the fact that many potential substitutes are themselves toxic materials. For example, barium, strontium and zirconium, which can provide a radiation shield, though not as well as lead, all present potential health or environmental concerns.

Television Tubes and Computer Screens. Cathode ray tubes for both television and computers emit radioactive gamma rays and X-rays when in use. Computer screens and television face plates and viewing screens therefore require a radiation barrier for consumer safety. The Nuclear Regulatory Commission has stated that lead represents "the best practical gamma shield material" and its use in protecting against X-rays is well-known. Because of lead's high opacity to radioactive energy, and the fact that large quantities may be incorporated in glass without impairing clarity or workability, it is the material of choice as a radiation barrier in the picture tubes and face plates of television sets, as well as computer screens and other video display terminals. Strontium, barium and zirconium also have some opacity to radioactivity but far more of these substances would be needed to equal the radiation opacity of lead, enough so that glass containing these other substances would lack stability and could not be formed satisfactorily. The introduction of high resolution or high definition television tubes (HDTV) will involve greater voltage and even more intense gamma and X-ray radiation, and therefore will require tubes with an even greater degree of shielding (radio-opacity) than current television does. Hence the use of lead will be even more essential.

Medical Uses. Because of lead's ability to provide a radiation barrier, lead shielding is required for the safe use of X-ray and other medical imaging devices, and in the use of radiation therapy for the treatment of intractable disease. Where radiation protection is needed in structures, such as X-ray rooms in medical offices, thick concrete or steel walls can provide equal radiation protection, but the result is an extremely heavy wall that is rarely feasible in retrofitting old buildings and poses structural problems in new ones. There is no satisfactory substitute for lead in providing personal protection in medical offices or for other medical uses such as analytical devices.

Nuclear Power Plants. Lead is widely used in nuclear power plants to shield workers from harmful radiation. Its superior radiation absorption abilities far outstrip theoretical substitutes. In particular, its use in lead-containing glass for observation windows used to monitor nuclear reactions is irreplaceable. In order to provide enough protection, these windows often contain as much as 80 percent lead; to obtain similar shielding values, a product made with strontium or barium would require concentrations at levels above 100 percent, a theoretical impossibility, or much thicker glass, which would decrease visibility to unacceptable levels.

Nuclear Disposal. The ability to block radiation also makes lead useful in containers for the shipment and disposal of high-level radioactive wastes. Most such containers use lead linings inside shells of stainless steel or nickel-based alloys. Substitutes are less effective and in addition do not offer as reliable protection against leaching, necessary to reduce the likelihood of radioactive leakage.

Aviation Soundproofing. Lead's density also enables it to screen sound waves. Leaded vinyl placed against the outer skin of an aircraft fuselage acts as a sound barrier, and may also act as a radiation shield at high altitudes. Other materials potentially useful as sound barriers have less screening ability than lead and would have to be used in such quantities to compensate for this that their use in aircraft is not practical.

Electronic Circuitry. Traditional lead alloy solder has wide and increasing application in the electronics industry. Lead alloy solder is used to connect the transistors, relays and other components attached to printed circuit boards to provide continuity for electrical systems, including those in missiles and satellites. Lead alloy solder also provides joints that are impermeable to gases and liquids. Lead solder is essential because its melting temperature is neither too high, which destroys sensitive components, nor too low, which leads to melting during normal board operations. Indium and bismuth alloy solders that do not contain lead are occasionally used as substitutes for lead alloy solder, but in printed circuit board manufacture lead is almost always added to indium and bismuth alloys because the resulting solder is less subject to failure. Indium alloys suffer the defect of having a 244-290°F melting range and are only used -- on a limited basis -- in specific low temperature applications. Bismuth alloys pose similar problems and tend to be brittle. In addition, both of these solders require special fluxes that create removal and reliability problems. Tin-silver and tin/antimony alloys require soldering temperatures about 70° higher than those required for tin/lead solders which rules out their use for soldering temperature-sensitive devices to printed circuit boards.

Light Bulbs. Because of its low softening and melting temperature range, surface tension and its resistance to devitrification, lead glass tubing is used in incandescent and fluorescent bulbs for exhaust tubing and flaring. The excellent electrical resistance, ease of formation and low melting point of lead glasses, along with ability to match the expansion coefficient of the metal leads which pass through the glass, make leaded glass an ideal product for use in light bulbs. There is no acceptable substitute for lead in the most rigorous applications, such as airport, stadium, and other outdoor lighting, and high intensity discharge lighting. Other types of glass melt at high temperatures, and do not withstand temperature shifts or the elements as well, significantly increasing their failure rate. Lead solder is also used in light bulbs. The principal potential substitute, indium-based solder, has disabling performance deficiencies.

Optical and Ophthalmic Glass. Because of its high refractive index and its freedom from color, lead oxide of a very high purity is used in the manufacture of eyeglasses and lenses for all kings of optical and ophthalmic products where precision and lack of distortion are required. These uses include:

1. Defense - surveillance camera systems, binoculars, periscopes, robotic sensing devices, lasers, night vision, scopes and goggles, X-ray astronomy (used in the "star wars" program), and target-fire control systems. High lead content glass is the critical element in microchannel plates that amplify low light emissions and make a range of image-intensifying technology possible. No known substitute can duplicate the capabilities of lead for these applications.

2. Medical - fiber-optic probes, camera systems, radiation protection. The image-intensifying abilities of leaded glass have also permitted development of X-ray machines that deliver lower doses of radiation to patients, since these special leaded glasses can enhance fainter X-ray images to equal the clarity of older, high-exposure X-rays.

3. Nuclear - hot cell shielding, material processing. There is simply no satisfactory substitute for lead in these applications.

Solder Glass. These special glasses are ground into powder and mixed with a liquid to form a paste, which is applied to the edges of cathode ray tube panels and funnels. The edges are then pressed together and fired, removing the liquid and fusing the solder glass, which securely bonds the two parts. Without a high percentage of lead, the solder will not work effectively.

Cable Sheathing. Main power lines operating at 15,000 volts require insulation that is impervious to moisture. Lead's malleability -- i.e., its ease of forming and extrusion -- and its stability and resistance to corrosion make it especially suitable for this use; efforts have been made to develop substitutes, such as plastics, but these have failed at an unacceptable rate. Also, in part because it is impervious to moisture and resists corrosion, lead is still used in sheathing for underwater telephone and power cables and cables that pass through poorly drained areas. The introduction of optical fiber cable has largely eliminated the use of lead in connection with new telecommunications cable, but lead is still needed in the retrofit of existing cable lines.

Ceramic Glazes. Because of several properties mentioned earlier -- low melting point, low surface tension, high index of refraction and resistance to corrosion -- lead in the form of lead-oxide is used widely in glazes. Food and Drug Administration guidelines ensure that lead and other toxic elements will not leach from these glazes in concentrations that pose a threat to human health. In fact, lead's exceptional chemical durability makes its leach resistance superior in performance capabilities to available alkali-based alternatives.

Piezo Electric Ceramics. Electronic ceramic compounds made of lead zirconate titanate have extremely high electrical conversion efficiencies and other properties that make possible a vast array of high-technology sensor devices used in many military and industrial applications.

1. Defense - acoustical sensors which will be placed in hydrophones throughout the earth's oceans to detect the silent submarine motors the Soviet navy has developed from technology improperly sold to it by Toshiba; guidance sensors for submarine torpedoes; pressure sensors for bomb detonations; piezo electrical components that are essential to sonar and are used in the hull of the Trident submarine to propel water from the front of the ship so that it can glide through quietly and quickly; "deformable mirrors" used in guiding laser beams around clouds, in research for the Strategic Defense Initiative.

2. Medical - ultrasound diagnostic equipment and cleaners for operating room instruments, laser scalpels, fetal monitors, intravenous blood pumps, and heart pump devices.

3. Automotive - 18 to 30 parts in modern cars depend on electronic ceramic components, including sensors that activate air bags, seat controls, safety belts, anti-lock braking systems, and air intake valves.

4. Nondestructive testing apparatus - state-of-the-art testing methods to detect structural flaws in steel building beams, aircraft fuselages, and railroad tracks.

5. Nuclear reactors - sensors used to monitor for reactor cracks and dangerous variations in reactor cooling water temperatures.

6. Flow and level meters - sensors to ensure that desired flow rates are maintained in oil pipelines, and that programed levels are adhered to in all kinds of food, chemical, pharmaceutical, and wastewater tanks.

7. Consumer appliances - sensors used in washing machines, microwave ovens, humidifiers, telephones, and almost all household appliances.

8. Vibration - motorized products - once charged with electrons, piezo electric ceramics operate as small motors, powered by extremely high speed vibrations. This property finds uses in drills for dentistry and construction, welding machines, robotics, and ink jet printers for computers.

New uses for piezo electric ceramics are being developed almost daily, and lead's special qualities -- its dielectric constant and coupling factors -- are without peer in forming the critical electrical properties in these compounds. No known substitute could replace lead in these applications.

Stabilizers for Plastic Wire Insulation. Lead stabilizers impart important properties to polyvinylchloride insulating sheathing for electrical wiring. Besides the usual protection offered against heat breakdown during processing (the function of a stabilizer), the lead stabilizer also contributes superior dielectric properties to the insulation. This means less likelihood that electrical wire will "short out" under heavy load, averting potentially disastrous home, apartment and appliance fires. No other substance potentially useful as a stabilizer is as effective.

Lead Bearings for Engines. To our knowledge, there is no suitable substitute for the use of lead in bronze and lead/tin/copper bearings used for all kinds of moving and sliding surfaces for mechanical equipment, ranging from electric motors to automobile and other internal combustion engines, wheel bearings, millions of pieces of production equipment such as looms, printing presses and all assembly line machinery.

Mechanical Weights. Lead is used in a variety of applications for mechanical weights. For example, lead weights permit optimum wheel balance in cars, a development which has been of critical importance to greatly increased automobile fuel efficiency over the past two decades. Lead weights were also the natural choice for counterweights in the limited space available for this purpose in Cruise missiles. In these and other applications, no substitute offers the same density as lead, and the use of alternatives would require redesign of components to accommodate larger volumes of the materials used in weighing. The use of larger components is problematic where space constraints exist, and in the case of wheel weights used in cars would have adverse effects on automotive fuel efficiency.

Architectural Uses. Lead-based roofing materials offer a number of advantages: they are lightweight, malleable, low-maintenance, waterproof, and corrosion-resistant.

New Uses. Because of lead's special properties, several new applications have developed, which represent advances over currently available materials. These new uses include:

1. Computer Chips. Lead has been instrumental in developing a new stable memory chip for computers that represents a major technological breakthrough because of its ability to retain data even when power is shut off. The conventional silicon chip lacks that capability and we know of no other substance that can provide it.

2. Lead Acid Load Levelling Batteries. Working with the Electric Power Research Institute, the International Lead Zinc Research Organization is examining the cost-effectiveness of a giant lead acid load levelling battery that could provide standby power during periods of peak electrical use and would eliminate the need to keep generators operating on so-called spinning reserve in order to meet peak needs. Use of these batteries could reduce fossil fuel consumption at electric power plants and lessen accompanying air pollutant emissions.

3. Radon Barrier Systems. A new sheet lead radon barrier system has been developed to combat the hazards posed by radon gas. If it proves effective and commercially viable in new homes, a counterpart retrofit system will be developed for existing homes. As radon in the environment is considered a leading cause of cancer deaths, the success of this project would provide important health benefits.

4. Molten Lead-based Electrical Energy. Extensive research has been done in Israel on a power generator, called ETGAR 3, capable of creating electrical energy directly from molten lead. A demonstration program is now underway.

5. Earthquake Shock Absorbers. The Japanese have begun to incorporate lead in building foundations to absorb earthquake shock. We believe it is only a matter of time before this technique is used in the United States as well.

6. Anti-oxidant Asphalt. A new lead-stabilized asphalt offers significant performance advantages over existing asphalts, which are subject to deterioration caused by oxidation. Testing is underway in Canada and has so far shown effective improvements compared to alternative products, and a lack of environmental hazard.

As I stated above, as additional information is developed we will pass it on to you.

Sincerely yours,

Jeffrey L. Zelms

Jeffrey L. Zelms
Chairman

JLZ/llm

STATEMENT OF JEROME F. COLE
PRESIDENT
INTERNATIONAL LEAD ZINC RESEARCH ORGANIZATION, INC.

BEFORE THE
SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

March 8, 1990

I am Jerome F. Cole, President of the International Lead Zinc Research Organization, Inc. (ILZRO), located in Research Triangle Park, North Carolina. ILZRO is supported by thirty-six companies which mine, smelt or refine lead or zinc, and another twenty companies which use these metals in the manufacture of their products. Altogether, our members are from twenty-one nations around the globe. ILZRO was established in 1958 to carry out research and development work on lead and zinc products.

In addition, since the mid-1960s our organization has sponsored a comprehensive program of research on the impact of lead production and use on environment and on human health. Our research has been carried out at universities and research institutions all over the world.

Today, I will address only one key issue. How strong is the evidence that low blood lead levels pose a significant threat to health? In making that judgment, one must look at the actual evidence. Basically, the evidence consists of a series of epidemiological studies in which children are followed from fetus to several years of age. Their blood lead levels have been measured on a regular basis and tests of their intelligence and neurological development have also been carried out. Major studies have been mounted in Boston, Cincinnati and Cleveland in the United States. Other major studies have been undertaken in Sydney, Australia and Port Pirie, Australia. Recently, additional studies have been initiated in Mexico City and in Titova Mitrovica in Yugoslavia. These studies have had a common objective: try to determine, after controlling for confounding variables, if lead has a detrimental effect on neurological and neurobehavioral development and on intelligence.

The principal investigators from each of the studies have met frequently throughout the course of the studies and efforts have been made to make the studies comparable.

However, the results are anything but consistent. They vary across the board. A look at the Tables 1, 2, and 3 demonstrate this clearly. Each of the five studies which have been underway for several years are listed along with the various outcome measures at various ages. One table lists the outcome measures based on prenatal blood lead levels; a second table shows the outcome measures based on postnatal blood lead measurements; and the third table lists various other effects on pregnancy outcome measured in the studies. Simple inspection shows the inconsistencies in the various studies. Some studies show certain effects at certain ages. others show other effects at other ages, and some studies show no effects at all. One of the studies, Cincinnati, finds effects only if it attributes low birthweight to lead, while the others show no birthweight effects at all.

Now, all these researchers are sound scientists, and I believe their results. But each study has its limitations, and each study population is somewhat different. And, at the bottom of it all, these studies are fundamentally statistical exercises and statistics are highly dependent on the subtleties of statistical approach. But common sense would say that if lead has a strong adverse effect, it should show up much more clearly and be consistent across the studies.

What these studies are saying is that if there is an effect at low blood lead levels, that effect is very small and it is not at all clear that there is any effect at all. The only way one can reach any other conclusion is to discount those studies which show no effect and to say that any measured effect - no matter what it is, when it occurs or how inconsistent it is, demonstrates an adverse lead effect.

Given all this and the fact that blood lead levels have been steadily declining over at least the past two decades, one is hard pressed to conclude that current levels of lead exposure pose much of an environmental health threat. EPA estimates the current average blood lead level in the U.S. today in children under 2 years of age to be 4.2 - 5.2 μg/dl.

Certainly, higher blood leads do exist, but generally blood lead levels in this country are low and are declining.

The magnitude of this decline is demonstrated clearly by Figures 1 and 2. Figure 1 shows a scatterplot of mean blood lead levels reported in U.S. population groups since 1935. Obviously, different laboratories were used along with different analytical methods. Also different population groups are represented. However, the trend is clear. Blood lead levels have been declining for over 50 years. Figure 2 shows some more recent data and plots individual studies which measured blood lead levels at one time and then measured them again at a later time. Again, it is clear that blood lead levels have been steadily declining. This is being accomplished by a long series of controls, both voluntary and regulatory, that have been in place for many years. Further, more stringent regulations would not seem to be necessary.

At this point, I'd like to make a few comments on the recent publication by Dr. Herbert Needleman in the New England Journal of Medicine. Based on limited blood lead measurements he estimated that the mean blood lead of his "high tooth lead" group was 34 µg/dl while the mean of his "low tooth lead" group was 24 µg/dl and hence were well in excess of today's average values. Nevertheless, his recent paper has created a considerable amount of media publicity and was cited as one of the reasons for scheduling these hearings.

As you know, the recent paper by Dr. Needleman was a follow-up of a study he published, also in the New England Journal of Medicine, in 1979. That paper became one of the most controversial ever published on lead. The U.S. EPA convened an "Expert Committee on Pediatric Neurobehavioral Evaluations" to evaluate the Needleman paper and the papers of Dr. Claire Ernhart of Case Western Reserve University in Cleveland, Ohio. A copy of their report to EPA is appended to this statement.

The report of the "Expert Committee" was very helpful in evaluating Dr. Needleman's work and the work of others. It uncovered errors in the original work, raised significant questions about methodology and resulted in a reanalysis of his work by Dr. Needleman, which he subsequently published. Unfortunately, the "Expert Committee" was never asked for its views on the adequacy of the reanalysis, but there is no doubt that the report had significant impact and raised considerable doubt about the adequacy of studies of the Needleman type.

One of the main criticism of the 1979 study was its failure to take adequate account of variables which may be termed "predictor variables" for outcome measures. These include social factors, measures of care-giving, and other factors which measure the child's degree of advantage or disadvantage. Without adequate co-variate control the I.Q. deficits reported in the study can not be attributed to their lead exposure. The new study suffers from the same deficiency and, with the exception of current alcohol use, does not take into account additional predictor variables which may have affected the child since the time of the first study. The only thing that the new study demonstrates is that I.Q. is a good predictor of later performance. That is, of course, well known. However, whether or not the I.Q. deficits were caused by lead is the question and that question was not adequately addressed by either study.

It is time that another "Expert Committee" be assembled to evaluate and try to make sense of the current studies. Each of the current investigators undoubtedly believes in his or her own approach and analysis, but we clearly need an objective evaluation by experts – not lead experts, not regulators, not industry, not environmental activists, but by independent scientists – expert in the field of psychiatry, learning disability, neurology, and statistics.

Such an evaluation must be done before we can assess the need for bans or even more stringent regulations than exist today. Certainly, we must assure environmental quality, but unnecessary regulation is something that does no one any good and can do a great deal of harm.

TABLE 1 - PRENATAL LEAD EFFECTS ON CHILD DEVELOPMENT IN FIVE LONGITUDINAL STUDIES

Cohort Name	Cohort Size and PbB Range	3 Month		6 Month		12 Month		18 Month		24 Month		36 Month		48 Month	57 Month
		MDI	PDI	MDI	PDI	MDI	PDI	MDI	PDI	MDI	PDI	MDI	PDI	GCI	GCI
Cincinnati	N=292 Prenatal 1-27 µg/dl Postnatal 1-30 µg/dl Neonatal 1-22 µg/dl	✓①	✓	✓①	✓①	○	Inc	-	-	○②	Inc				
Port Pirie	N=548 Prenatal X=9.5 Postnatal 6-57 µg/dl	-	-	-	-	-	-	-	-	○	○	○	○	○	
Sydney	N=202 Prenatal 0-29 µg/dl Postnatal 0-29 ug/dl	-	-	○	○	○	○	-	-	○	○	○	○	○	
Boston	N=249 Prenatal 0-25 ug/dl Postnatal 0-25 µg/dl	-	-	✓	-	✓	-	✓	-	✓	-	-	-	-	○②
Cleveland	N=260 Prenatal 0-15 µg/dl Postnatal 0-30 µg/dl	-	-	✱③	✱③	○	○	-	-	○	○	○	○	○	

1. Indirect relationship through lead's affect on birthweight, growth and maturation.
2. Neurobehavioral catch-up response.
3. Maternal blood leads significantly related to MDI, PDI and Kent Infant Development (KID) scores. Cord leads not related. Additionally, 6 month PbB's not related to 6 month MDI and PDI and positively related to 6 month KID.

✓ Effect
○ No Effect
✱ Questionable Effect
- Analysis Not Done
INC Data Incomplete Study Ongoing

MDI = Mental Development Index
PDI = Psychomotor Development Index
GCI = General Cognitive Index
N = Number
X = Mean
µg/dl = Micrograms of Lead Per Deciliter Blood
PbB = Blood Lead

SOURCE: ILZRO

TABLE 2 - POSTNATAL LEAD EFFECTS ON CHILD DEVELOPMENT IN FIVE LONGITUDINAL STUDIES

Cohort Name	Cohort Size and PbB Range	6 Month		12 Month		18 Month		24 Month		36 Month		48 Month	57 Month
		MDI	PDI	MDI	PDI	MDI	PDI	MDI	PDI	MDI	PDI	GCI	GCI
Cincinnati	N=292 Prenatal 1-27 µg/dl Postnatal 1-30 µg/dl Neonatal 1-22 µg/dl	✓①	✓	✓①⑦	Inc	-	-	○②	Inc	▨	▨	▨	▨
Port Pirie	N=548 Prenatal X=9.5 Postnatal 6-57 µg/dl	-	-	-	-	-	-	○③	○	○	○	✓④	▨
Sydney	N=202 Prenatal 0-29 µg/dl Postnatal 0-29 µg/dl	○	○	○	○	-	-	○	○	○	○	○	▨
Boston	N=249 Prenatal 0-25 µg/dl Postnatal 0-25 µg/dl	○	○	○	○	○	○	○	○	-	-	-	✓⑤
Cleveland	N=260 Prenatal 0-15 µg/dl Postnatal 0-30 µg/dl	○⑥	○	○	○	-	-	○	○	○	○	○	○

1. The association with 10 day PbB was significant
2. Neurobehavioral catch-up response
3. After control of covariates, 6 month PbB related negatively at P=.07
4. Significantly related to 6, 24 and 36 month blood leads. Effect stronger for girls than for boys
5. Significantly associated with 24 month blood lead level but differs significantly by social strata
6. Concurrent blood lead is significantly and positively related to Kent Infant Development scores
7. Two of 30 infant behavioral items significant with 10 day PbB. Effect disappears at 24 months

✓ Effect
○ No Effect
- Analysis Not Done
INC Data Incomplete
▨ Study Ongoing

SOURCE: ILZRO

PbB = Blood Lead
MDI = Mental Development Index
PDI = Psychomotor Development Index
GCI = General Cognitive Index
N = Number
X = Mean
µg/dl = Micrograms of Lead Per Deciliter Blood

TABLE 3 - LEAD EFFECTS ON PREGNANCY OUTCOMES IN FIVE LONGITUDINAL STUDIES

Cohort Name	Cohort Size and Prenatal PbB Range	Neurological Soft Signs	Placental Membrane	Language Development	Length	Gestational Age	Birthweight	Preterm Birth/ Obstetrical Complications	Head Circumference
Cincinnati	N=383 1-27 µg/dl	-	-	-	✓	✓	✓	○	○
Port Pirie	N = 723 X=9.5	-	✓	-	-	✓	○	✓	-
Sydney	N = 298 0-29 µg/dl 75% ≤10 µg/dl	-	-	-	-	○	○	○	-
Boston	N=249 0-25 µg/dl	-	-	○	-	○	○	○	-
Cleveland	N = 260 Mat 2.7-11.8 µg/dl Cord 2.6-14.7 µg/dl	✓①	-	○②	○	○	○	○	○

1 Cohort size was 132

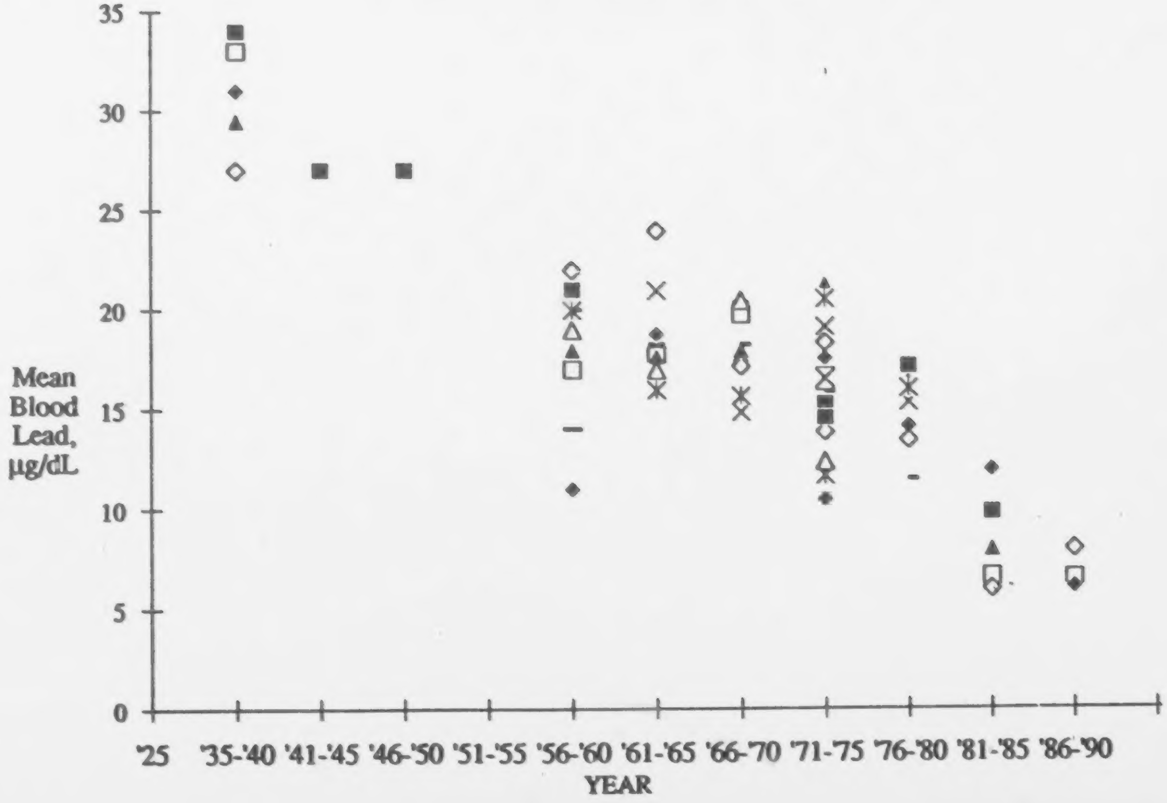
2 One out of 30 language tests was significantly related to cord blood mean length of utterance; however, concurrent 2 year PbB levels were positively related to a decrease in "unintelligible utterances."

N = Number
X = Mean
µg/dl = Micrograms of Lead Per Deciliter Blood
PbB = Blood Lead

✓ Effect
○ No Effect
- Analysis Not Done

SOURCE: ILZRO

FIGURE 1 - U.S. BLOOD-LEAD VALUES FROM LITERATURE 1935-1990



U.S. BLOOD-LEAD VALUES FROM LITERATURE - 1935-1990

	A	B	C	D	E	F	G	H	I
1			Mean						
2			Blood Lead,						
3	Point		µg/100 ml		No. in				
4	No.	Year	or /100 g		Group		Location	Reference	
5									
6	1	1935	58		71		U.S.A.	Kehoe	1
7	2	1936	34		89		St. Louis	McMillen	2
8	3	1938	33		36		Phila., PA	Smith	3
9	4	1938	31		126		Baltimore	Kaplan	4
10	5	1939	27		30		U.S.A.	Kehoe	5
11	6	1939	29.5		22		Phila., PA	Letonoff	6
12	7	1946	27		30		U.S.A.	Kehoe	7
13	8	1956	28.5		261		Cincinnati	3-City	8
14	9	1960	21		81		L.A., CA	3-City	8
15	10	1960	17		93		L.A., CA	3-City	8
16	11	1960	11		37		Alpine Co., CA	3-City	8
17	12	1960	22		123		New Orleans	Hofreuter	9
18	13	1960	18		128		Dallas	Hofreuter	9
19	14	1960	19		131		Denver	Hofreuter	9
20	15	1960	20		97		Chicago	Hofreuter	9
21	16	1960	20		112		New York	Hofreuter	9
22	17	1960	20		137		Cincinnati	Hofreuter	9
23	18	1960	14		162		Rural Ohio	Hofreuter	9
24	19	1961	18		237		Phila., PA	3-City	8
25	20	1962	17.7		518		L.A., CA	3-City	8
26	21	1962	18.8		10		Washington, DC	Siegel	10
27	22	1963	24		381		Cincinnati	3-City	8
28	23	1963	17.7		47		Pasadena	Butt	11
29	24	1963	17		33		California	Goldwater	12
30	25	1963	21		105		New York	Goldwater	12
31	26	1963	16		40		Ohio	Goldwater	12
32	27	1967	20.1		490		U.S.A.	McLaughlin	13
33	28	1968	19.8		528		U.S.A.	McLaughlin	13
34	29	1969	17.5		193		Pasadena	Tepper	14
35	30	1969	17.2		80		Los Alamos	Tepper	14
36	31	1969	18		150		Ardmore	Tepper	14
37	32	1969	20.5		136		Rittenhouse Sq., Phil. PA	Tepper	14
38	33	1969	14.9		191		Los Alamos	Tepper	14
39	34	1969	15.7		162		Okeana, OH	Tepper	14
40	35	1970	18.3		869		U.S.A.	McLaughlin	13
41	36	1971	15.3		198		Port Washington, NY	Tepper	14
42	37	1971	16.6		140		Greenwich Village, NY	Tepper	14
43	38	1971	17.6		147		Bridgeport, IL	Tepper	14
44	39	1971	13.9		208		Lombard, IL	Tepper	14

U.S. BLOOD-LEAD VALUES FROM LITERATURE - 1935-1990

	A	B	C	D	E	F	G	H	I
45	40	1971	12.5		191		Houston	Tepper	14
46	41	1971	19.2		219		Washington, DC	Tepper	14
47	42	1972	19.2		420		U.S.A.	McLaughlin	15
48	43	1973	11.7		403		S. California	Goldsmith	16
49	44	1973	15.9		114		Hartford	Osborne	17
50	45	1973	17		76		Honolulu	Joselow	18
51	46	1974	14.6		89		Ann Arbor, MI	Hecker	19
52	47	1974	16.4		126		Los Angeles	Johnson	20
53	48	1974	10.5		119		Lancaster, CA	Johnson	20
54	49	1975	18.4		36		Houston	Johnson	21
55	50	1975	21.3		36		Houston	Johnson	21
56	51	1975	12.4		81		Houston	Johnson	21
57	52	1975	16.6		258		U.S.A.	Baker	22
58	53	1975	20.6		236		Fontana, CA	Wei Liang	23
59	54	1976	17.2		56		Upstate, NY	Perkins	24
60	55	1976	15.7		60		Salt Lake City	Smith	25
61	56	1977	14.2		76		Culver City, CA	Report	26
62	57	1977	13.5		25		Culver City, CA	Report	26
63	58	1977	16.3		19		U.S.A.	Hammond	27
64	59	1978	16.3		67		Culver City, CA	Report	26
65	60	1978	15.4		43		Culver City, CA	Report	26
66	61	1978	16.1		44		Culver City, CA	Report	26
67	62	1979	11.5		9		Atlanta	Landrigan	28
68	63	1981	9.85		695		Louisville	Angell	29
69	64	1982	6.6*		11837		Boston, MA	Rabinowitz	30
70	65	1983	12		122		Pinehurst, ID	CDC	31
71	66	1983	6		61		Helena, MT	CDC	31
72	67	1983	8				Festus, MO	Phillips	32
73	68	1986	6.5*		216		Boston, MA	Bellinger	33
74	69	1986	6.5		118		Cleveland, OH	Ernhart	34
75	70	1986	6.1		258		Telluride, CO	Albert	35
76	71	1987	8		305		Cincinnati, OH	Dietrich	36
77									
78									

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1935 - 1990

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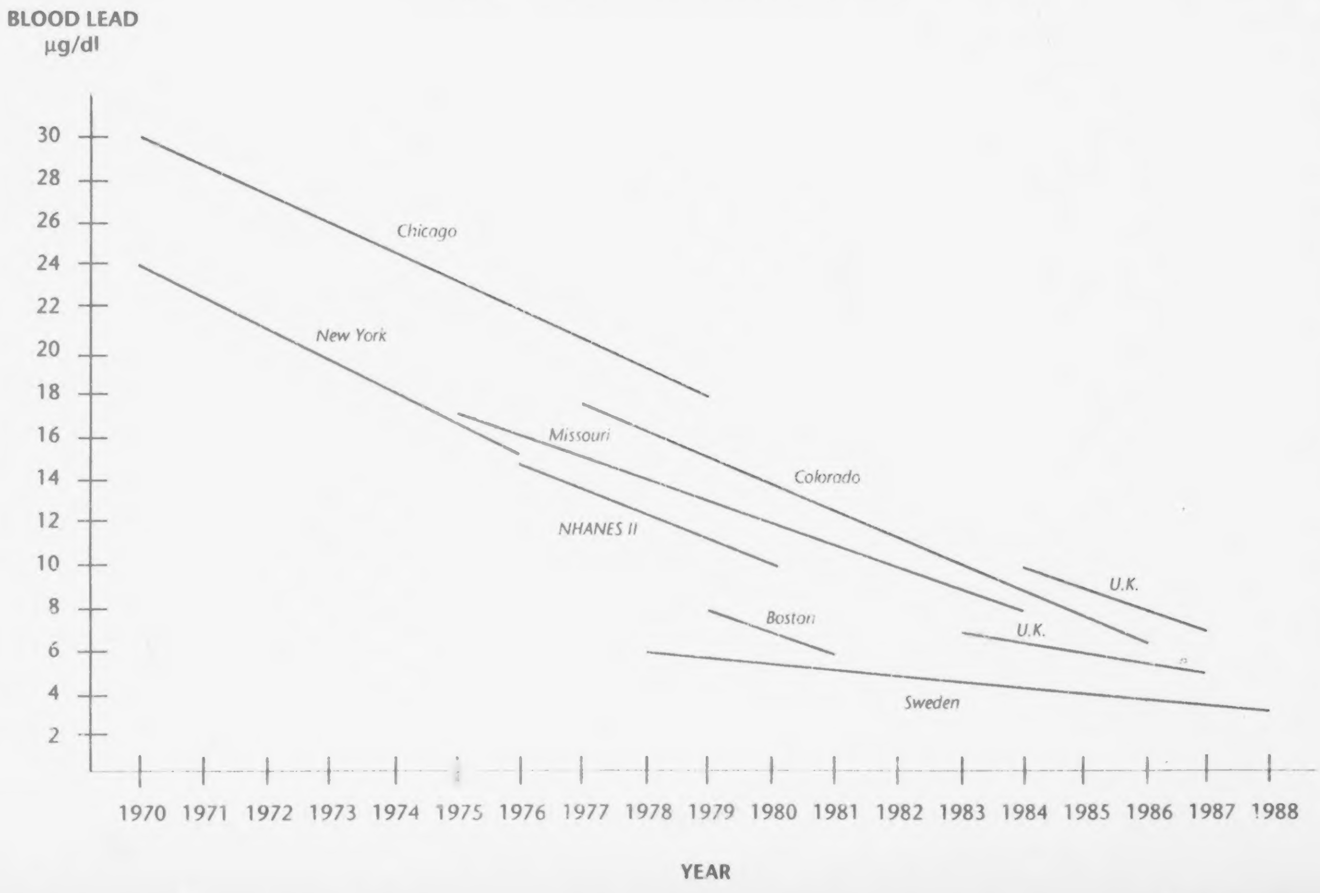
FIGURE 2 - TIME TRENDS IN BLOOD LEAD LEVELS



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March 20, 1990

Senator Harry Reid
324 Hart Senate Building
Washington, D.C. 20510-2803

Dear Senator Reid:

I want to express my appreciation for the opportunity to appear before your Subcommittee on March 8 to testify concerning lead health issues.

I understand your concern that the lead industry not appear to be intransigent on these issues, but I feel that our record has been a good one. We have long recognized that lead can present toxicity problems in certain uses, and more than 35 years ago we spoke out against its use in interior housing paint.

A principal reason for my testimony on the question on the low level effects of lead on children is that it has been suggested that lead production in the U.S. should be curtailed or eliminated for health reasons. For example, the Environmental Defense Fund has proposed a tax on primary lead which EDF acknowledges is designed ultimately to drive primary lead producers out of business. It seems to me that before Congress entertains such a proposal it should consider whether the studies on low level effects of lead are consistent and whether those that purport to show an effect show a strong one. My testimony was designed to show that the studies are not consistent -- some show an effect, others do no -- and the alleged effect is in any event small. The tables included with my statement summarize the data from all five of the major prospective studies attempting to relate low-level lead exposure to neurobehavioral and intelligence deficits. The results simply do not meet several of the key tests for determining, by epidemiologic studies, if low level lead exposure causes adverse effects. Even the EDF in its "Report and Proposal for Legislative Action" (March 1990) listed, on page 9 of their document, five criteria for showing cause and effect through epidemiological studies.

Certainly, Tables 1, 2, and 3 of my statement demonstrate that the relevant studies are not "consistent", one of the criteria for determining causality. For example, only the Cincinnati study found an effect on birthweight. Only the Boston study showed effects of prenatal blood lead at 12 and 24 months. In both the Cincinnati and Boston studies, effects seen at early ages disappear on later examination. Inconsistencies abound. Another criterion, "specificity" is also not met by the studies because it is clear that lead is only one of a great many possible causes for neurobehavioral effects.

Therefore, while there is no argument that old lead-based paint in deteriorated housing is a serious problem which may result in elevated blood levels, the analysis of these five studies provide no evidence that blood lead levels below today's guidelines (below 25 µ/dl) result in any harm to health.

Certainly, the most cost effective means of controlling the problem that does exist is to target resources at the problems that do exist and that is the prevention of blood lead levels above today's guidelines.

In my statement, I noted that Dr. Needleman's recent publication in the New England Journal of Medicine, cited as one of the reasons for convening the hearing, was a follow-up on his heavily criticized 1979 study. A further, more detailed critique of his more recent study is appended to this letter.

Of concern beyond the scientific validity of Dr. Needleman's work, however, was the implicit suggestion, especially in Senator Lieberman's comments, that it is inappropriate to criticize Dr. Needleman's work and that it should be accepted without question because of his preeminence in the field. There are two things wrong with that position, first Dr. Needleman is one of many scientists who have spent most of their professional lives studying the effects of lead on the environment; second, blind acceptance of any scientist's data is wrong and can lead to disastrous results. Scientists such as Dr. Julian Chisolm of Johns Hopkins University, Dr. Paul Hammond of the University of Cincinnati, Dr. Donald Barltrop of Westminster Hospital Medical School (London), Dr. Claire Ernhart, Case Western Reserve University (Cleveland), for a few, have contributed at least as much as Dr. Needleman to the understanding of lead's effects on health. Their views and the views of others should be sought as well.

Also, I must object to Dr. Needleman's assertion that lead industry-sponsored research is somehow suspect. It would seem that industries should be encouraged to sponsor environmental research programs on their products rather than discouraged from doing so by questioning the credibility of researchers funded by industry.

Dr. Needleman has been using this tactic for many years and has been challenged by many in the scientific field. Several published letters on this subject, which appeared in Environmental Science and Technology are enclosed for your information. Dr. Needleman extended his philosophy to a refusal to participate in an industry-sponsored conference on lead held at Duke University in 1985. The enclosed correspondence between Dr. Needleman and Drs. Goldwater and Huebner of Duke University Medical Center present an enlightening contrast in approach toward scientific discussion.

In summary, then, I would reiterate our view that what is needed is an objective review of the relevant scientific data on the effects of lead at low blood lead levels. This should not, however, impede efforts to correct the problem of exposure from old lead based paint in deteriorated housing.

Sincerely,

Jerome F Cole

Jerome F. Cole
President

Attachments

ILZRO Comments on: Needleman H.L., Schell A., Bellinger D., Leviton A. and Allred E. (1990) "The long-term effects of exposure to low doses of lead in childhood," New England Journal of Medicine, 322, 83-88.

General Comments

1. Persistence of lead effects

The question of the persistence of lead effects is a very important one. It is important to know if lead effects diminish or disappear if the source of lead is reduced or removed, or if the damage caused by lead is permanent. Within this there is also the question of critical periods of exposure - are lead effects more damaging and persistent if they occur at certain critical periods of development. In practice, persistence has been interpreted in various different ways. In animal studies it is usually interpreted as the continuation of effects after exposure ceases (i.e. are there differences from controls in maturity in animals dosed only when young.) This is true persistence, demonstrating that the effects are irreversible. In human studies, persistence is usually translated somewhat differently - to mean that deficits picked up at one age are apparent at a later age; or similarly, outcomes measured at time two are associated with lead measures taken at time one. This sort of model makes no assumption that the current lead exposure is different from past exposure, so it is really a test of whether lead effects persist, with continuing exposure, or whether there is some habituation or diminution of effect.

In practice, the second model is used to test for critical periods of exposure. It is known that in most cases, children's blood lead level rises from birth and peaks between one and two years of age. After that there is usually a gradual slow decline in blood lead levels, probably largely attributable to a change in children's habits (less frequent mouthing), with increasing age. This period of maximum exposure coincides with the period of maximum brain growth, and so might be deemed a critical period on both counts. The appropriate study might be to see whether current lead exposure at age two or three affected performance at that age. However this is of relatively little importance if lead effects disappear with age. Thus it is more important to test for the persistence of the lead effects. Effects which appear at one age but are not apparent at all at later ages (in any measures) are of little significance. A second related reason for testing for persistence of lead effects is that below the ages of three, developmental progress is at its fastest, but at the same time there is a considerable amount of individual variation in development. The measures usually used are developmental assessments and do not equate to later psychometric measures such as IQ and reading assessments. More importantly they have relatively low predictive significance for later IQ, so concurrent measures tell little about future performance. Some of the longitudinal studies now in progress are testing this form of persistence. That is, seeing whether lead measures taken when children were younger were associated with outcomes measures years later, (and whether lead-associated deficits detected at age two or three were evident some years later).

This current study has tested 'persistence' from the ages of 7 to 18. At these ages it would be expected that there would be considerable continuity of skills and performance form one period to another, for a number of reasons. In the first place, for genetic reasons: one of the reasons for choosing to test children at the age of seven is that by then there is a reasonably high predictive significance in measures such as IQ and reading ability, and so the correlation between IQ measures taken at different times is reasonably high. It follows that differences (in groups of children) detected then are likely to persist, and be meaningful in later life. Secondly, there is considerable environmental continuity in factors other than lead - for example, if a child is relatively deprived or disadvantaged at seven, they are likely to be similarly placed at eighteen, and this continuity would apply to most of the social and environmental factors. Thirdly, there is the 'vicious cycle' argument. Simply put, this suggests that if a child is doing poorly at one stage, this will disadvantage them for the future, so that the effect will be cumulative and persistent. It has been demonstrated that the effect of being a poor reader in school is one of cumulative disadvantage, as the reliance on written instructions becomes greater.

The important upshot of this is that the sort of result described in the current paper would be expected from any group identified as doing less well at age seven, and the fact that deficits in performance 'persist' does not make it any more, or any less, likely that they are caused by lead. In fact, since the indications are that the body lead burden of the group has come down significantly, it would have provided support for lead as a causal explanation of the deficits reported in 1979, if there were no differences in outcomes in the current study!

2. Type of variables controlled

This could be called a specific point, but since it is so important to the interpretation of these (and the 1979 results) it is covered here. It also reflects the fact that, as indicated above, the interpretation of these results depends very much of the interpretation of the 1979 results, since the cause or causes of those deficits detected then, whether it was genetic differences, social or other non-lead environmental differences, or lead, is likely to be the cause of the differences detected in this study.

There is now quite a body of information which shows that in most urban environments there is a significant association between socially disadvantaging factors and body lead levels. At the same time, social disadvantage is known to be associated with deficits of exactly the type reported here - for example, school failure, school dropout, and reading disability. This has posed the basic problem for lead studies in that lead uptake is not random, and the same sorts of variables which are related to uptake, are also related to performance on the outcomes of interest. The indications in the 1979 paper were that the high lead group were slightly more disadvantaged, although the nature of the disadvantage was not fully explored.

Disadvantage can be quite subtle - for example depression or poor mental health in the mother, or a poor marital relationship can be considered a disadvantage. Studies consistently report negative effects in children associated with maternal depression, or a discordant marital relationship. This sort of factor is inadequately measured by broad social indicators such as social class, or the mother's age at the child's birth.

The study published in 1979 was criticized for failure to take adequate account of variables which might be termed predictor variables for the outcomes. This study could be criticized on the same account, to an even greater degree. While the authors may be correct in their contention that many covariates which were important predictors of performance at earlier stages would have less effect on the subjects' performance in adulthood, there will be other variables which will have an effect, and they do not appear to have allowed for this. The only new and relevant variable which is mentioned is current alcohol use. What about the use of other drugs, current living circumstances, parental relationship and support, etc.? It is not clear whether information on this sort of variable was collected (the suggestion is that it was not) but the result, is that the end list of covariates controlled is quite inadequate, and they are the wrong sort of variables, as they are broad indicator variables, and not explanatory variables.

Specific Points

3. The deficits found in 1988 are consistent, with one exception, with those which would be expected (whatever their cause) from the findings in 1979. The association between behavior problems as a child and later antisocial or delinquent behavior has been demonstrated in several studies. Lower vocabulary and verbal reasoning skills, and longer reaction time would have been predicted from the original results. The exception is the reading disability, since the Peabody test of reading was used in the 1979 study, and no significant differences were reported (the group test results were not given for non-significant tests). It could be said that the other differences reported in 1979, the IQ differences, the attentional differences, etc., could underlie the differences in reading found in the current study, but it is still surprising that they were not evident in 1979.

4. In the 1979 paper, although it was clear that 270 children were tested, 112 (41%) (35 high lead, 28 low lead, and 49 unclassified) of these were excluded from the results presented. The reasons for exclusion were that a later tooth was discordant (36) or that they were not discharged form hospital with the mother, had a possible head injury; were reported to have plumbism, or came from a bilingual home (76). The numbers in the subdivisions of this category are not specified.

In the reanalysis reported in 1985, the sample for whom results was presented was increased form 158 to 221 with the addition of subjects "previously dropped because of discordant lead concentrations" in different teeth. This is an additional 63 children, and not 36 as stated were excluded for this reason in the 1979 paper, which in itself is odd. The 1979 results for the entire sample of 270 children have never been presented. The current paper describes the difference between those retraced and tested in 1988, and those not, but it does not describe how the 132 for whom 1988 results are presented relate to the 158 for whom results were presented in 1979 (or the 221 for whom IQ results were published in 1985). The main test, it is true, is between lead measures taken at time one (in this case at age seven) and outcomes at time two (age 18) but it would be better to be able to compare the same sample on the outcome measures as time one and time two.

5. The tracing rate of 65% is on the low side, but probably adequate as there is information to indicate how the sample traced differ from those who were not traced. The biases in the sample traced in 1988 are consistent and to be expected with an adult volunteer population (see Rosentahl and Rosnow, 1969) in that they are more likely to be female, brighter, better behaved, and of higher social class than those not traced or not willing to cooperate.

6. The refusal rate is on the high side at 25%, and it is unfortunate that there is not more information on this group. They could, for example, have been treated separately from those not traced in comparisons of 1979 data. It would also have been interesting to know if the reasons for refusal were known - for example, were they more likely to live further away than subjects taking part.

7. The authors content at the beginning of the discussion that any effects of selection bias are likely to be in the conservative direction, and therefore to underestimate the strength of effect. This is not necessarily so because, although there are social biases in the sample currently traced, there are also biases with respect to the original lead grouping, with fewer high lead children traced. If the biases could be demonstrated to exist within the lead groups (i.e. that tested children within the high lead group were brighter, better behaved, etc., than other high lead children not tested in the current study) then their comments would be correct.

8. Blood samples were taken from 48 children (36% of the current tested sample) at the time of reexamination, in order to estimate current exposure. Since the blood lead levels were uniformly found to be low, blood sampling was discontinued. There is no information on what proportion of these children were originally classified as low lead, or as high lead, and although they might be assumed to be randomly distributed, it would be reassuring to have this data, especially since half the sample retraced and tested were originally classified as low lead.

9. The use of computer based automated assessment may handicap more socially disadvantaged children and young adults. These children are less likely to have access to home computers and computer games, and, therefore, are less familiar with the format, and have less experience and practice with the practical skills, such as the use of joysticks, etc. The indications were that the 1979 high lead children were somewhat more disadvantaged as a group than the low lead children.

10. The small group (n=10) reported to have had plumbism has been included in this paper in order to add a clarity to the dose response relationships. However, from a technical point of view, they should not be treated as a separate group, if included at all. The reason is that there is no information on the lead levels of other children at other times, and they may have had very much higher (or lower) body lead at some point (either before the sampling at seven, or since that time). The children reported to have plumbism should, if included, be categorized according to their tooth lead levels at age seven, like the rest of the sample. If the plumbism was reflected in higher tooth lead levels (as it should be) then they would have been categorized in the high lead group anyway. If the deficits in performance are greater in this subgroup (as they appear to be), this would act to increase the size of the difference between groups.

Summary

In summary, this paper does not add any significant information to the body of literature on lead effects. The interpretation of the likely causes of the differences found depends almost entirely on the interpretation of differences reported in the 1979 paper. This is because, by the age of seven, there is reasonably good predictive significance in psychometric measures, and group differences detected at that age, whatever their cause, would be expected to 'persist' and be apparent some years later.

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STATEMENT OF ROBERT J. MUTH
VICE PRESIDENT - GOVERNMENT & PUBLIC AFFAIRS
ASARCO INCORPORATED

BEFORE THE
SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

March 8, 1990

Mr. Chairman and Members of the Committee, my name is Robert J. Muth, Vice President - Government & Public Affairs, ASARCO Incorporated. I appreciate this opportunity to discuss the environmental regulation of lead and to explain why the lead industry believes that currently produced products containing lead can be used safely. We believe this is reflected in EPA's finding that national blood lead levels have declined far more rapidly than was projected by the Agency. We believe this decline results not only from changing uses of lead, but also from its high recycle rate and the fact that it is subject to comprehensive governmental regulation.

Blood Lead Trends

In 1978, EPA promulgated a National Ambient Air Quality Standard for lead that EPA's Administrator found would protect public health with an adequate margin of safety. EPA's goal in adopting the standard was to reduce the blood lead levels of 99.5 percent of the nation's children below 30 micrograms per deciliter (μg/dl). EPA estimated that in order to achieve this goal the mean blood lead level of the nation's children would have to be reduced to 15 μg/dl.

In addition to EPA's adoption of a national air quality standard, sources of public lead exposure have been reduced since 1978 in many other ways as well. The lead content of food and water has been reduced. Lead has largely been eliminated from gasoline.

There is evidence that the average blood lead level of children in the United States is now much lower than 15 μg/dl, and EPA's 1978 goal has been exceeded. A recent study by EPA's Office of Air Quality Planning and Standards estimates that the mean blood lead among the general population of U.S. children is now 4.2 to 5.2 μg/dl -- a much better result than the targeted 15 μg/dl mean.[1]

EPA's Staff Report prepared as part of the review of the lead air quality standard estimated the mean blood levels of children living near three major point sources of lead (in Montana, Texas and Florida). This Report projected that even for these children mean blood lead levels would range between 3.6 and 5.6 μg/dl in the early 1990s.[2] These levels are in line with the estimated national mean range and are projected to be achieved without any tightening of air or water standards.

When EPA's national air quality standard for lead was promulgated, the then Administrator of the Agency, Douglas

Costle, acknowledged that the standard was being set so low that it would be difficult for many sources to meet. That has certainly proved to be true. Although ASARCO is in compliance with the state implementation plans at each of our three lead-producing plants, the lead ambient air quality standard is not always met at all stations in the vicinity of our three facilities. To put this in context, though, looking at the facility that has the greatest difficulty in meeting the standard, a 1983 CDC study demonstrated that mean blood lead levels for children living near this Montana facility was below the EPA mean target of 15 μg/dl. ASARCO also has recently reached agreement with the state of Montana to undertake an innovative study to upgrade the SIP and has recently made a major investment to further reduce lead emissions. At each of the other two facilities the ambient standard has been exceeded only at a single location, each far removed from residential areas.

Lead in Food and Drinking Water

EPA estimates that public exposure to lead in food and water has decreased by 84% from the 1978 level, and is continuing to decline.[3] This is attributable to the declining use of lead solder in food cans, reductions of atmospheric lead emissions and deposition, limitations on the leachability of ceramics imposed by the Food and Drug Administration and on the lead content of drinking water.

In the case of drinking water, EPA estimates that over 99 percent of the nation's public drinking water systems meet the current standards -- which EPA proposes to tighten.[4] However, some public drinking water systems deliver water that has not been treated to reduce corrosivity. When that water comes into contact with lead in delivery lines or household plumbing, leaching action can result in unacceptably high lead levels in first flush samples at the tap.

We agree this is an area in which further regulatory action is called for. Lead Industries Association submitted comments to EPA urging the agency to adopt drinking water regulations requiring public systems to utilize a treatment technique for corrosivity where water passes through lead pipes. Such techniques are already used in some cities. Attached to LIA's comments was a study by Resource Consultants, Inc., which specializes in water treatment issues, demonstrating that adoption of such a requirement is eminently feasible and quite effective. EPA has indicated that it is considering imposing such a requirement, and if EPA does so the problem of lead in drinking water should be behind us.

Lead in Municipal Solid Waste

With the enactment of RCRA, industrial hazardous waste can no longer be disposed in municipal incinerators or municipal solid waste landfills. And since 78 percent of the lead produced in this country is used for automobile and industrial batteries and we believe the recycle rate for automotive batteries is at least 90 percent, most lead used in consumer products does not enter the municipal waste stream. And there is no evidence that the lead in batteries that does reach municipal landfills leaches into groundwater. Furthermore, legislation is before the Congress designed to increase the battery recycle rate by banning the disposal of lead-acid batteries in landfills or municipal incinerators. ASARCO supports enactment of such legislation which should all but eliminate lead acid batteries in municipal waste.

Most of the lead used in other consumer products disposed in landfills is not susceptible to leaching and thus cannot migrate to underground waters. Examples include the lead employed in plastics, crystal and glass, and in computer and television screens. In all of those applications, lead is bound into the chemical matrix and will not escape through leaching action. Finally, the one remaining significant source of potentially leachable lead in municipal landfills, lead solder in cans, has been greatly reduced.

These facts are reflected in the low concentrations of lead in the leachate found in post-RCRA municipal solid waste landfills and in municipal incinerator emissions to the air. A 1987 EPA-sponsored study by NUS Corp. and Versar, Inc., concluded that lead leachate levels in post-RCRA municipal solid waste landfills are very low, far below the level at which EPA considers wastes to be hazardous.[5] When tested in the laboratory lead concentrations in some incinerator ash exceed the level defined by EPA as hazardous. However, when actual leachate from monofills containing only incinerator ash was analyzed, EPA's contractors found levels to be well below the level of lead that EPA considers to be hazardous. As for incinerator air emissions, EPA's studies indicate that none of the existing 186 U.S. municipal incinerators exceeds the National Ambient Air Quality Standard for lead. A 1987 EPA study notes that modeled lead concentrations never exceeded 60 percent of the lead NAAQS, even at the worst facility.[6] Similarly the Brooklyn incinerator study reports that lead air standards were never exceeded in their modeling exercises.[7] Planned facilities will incorporate newer technologies that will reduce lead emissions further.

Regulation of Workplace Exposure to Lead

OSHA regulations limit worker exposure to lead in air through a combination of engineering controls, work practices, respirator use and a host of administrative requirements. The regulations also require periodic testing of worker blood lead levels and the removal of workers, at full pay, from exposure to lead when their blood lead measurements exceed specified levels. The removal program thus imposes a biological standard in addition to the conventional standard limiting airborne concentrations of lead. This provides additional insurance against adverse health effects resulting from lead exposure.

As in the case of the ambient air quality standard for lead, OSHA's workplace standards have presented the industry with a considerable challenge. However, we have succeeded in our Company since 1980 in reducing average worker blood lead levels from 40 μg/dl to 27 μg/dl, and today in all our plants we have but one employee on medical removal.

Lead in Deteriorating Household Paint

Despite gains in reducing national blood lead levels, flaking, peeling and deteriorating lead paint, some of it a century old, may result in potentially hazardous blood lead levels for some residents in older homes. Such problems are most likely to occur in the case of children living in aging public housing units where lead-based paints may not be well maintained, yielding lead-bearing dust. Lead Industries Association has for many years worked with government officials to identify and help implement solutions to the problems created by deteriorating lead paint. Increased governmental and private sector efforts in four key areas could yield significant further results.

First, we support the restoration, expansion and strengthening of community blood lead screening programs. These programs are one important key to determining which children are at risk and which housing units need abatement. LIA has long been active in promoting screening programs and could lend its expertise to any efforts to expand and improve these programs. We also endorse the congressional authorization of $22 million to the Centers for Disease Control (CDC) to provide grants to municipalities for screening programs. The funds actually allocated to CDC for this grant program should be significantly expanded from the $4 million appropriated by Congress for fiscal year 1990.

Second, technologies to detect the presence and concentration of lead in deteriorating paint as well as laboratory analytical procedures must be improved and standardized. The current use of the X-ray Fluorescence (XRF) Detection Device, for example, may sometimes produce misleading estimates of the actual amount and concentration of lead found in household paint. New technologies and methods are needed to detect more accurately the levels of lead in deteriorating paint and the resulting dust. Greater consistency and accuracy are also needed in the laboratory procedures used to detect lead in paint and dust. Once appropriate technologies and laboratory procedures are defined, laboratories conducting lead analysis should be certified to ensure that proper procedures are followed.

Third, education programs should be expanded for health professionals and the general public. The potential health risks from exposure to lead in deteriorating paint can be minimized if the problem is clearly understood. Education programs are needed to help families recognize the risk and learn what they can do to reduce their potential exposures to lead. Complementary educational programs should be directed to health professionals to help them detect and address problem situations more effectively.

Fourth, abatement and prevention techniques must be improved to minimize the health risks to individuals living in households with lead-based paint. No consensus exists on the most cost-effective abatement techniques. The HUD guidelines due for release in early April should provide some direction on this issue. While ideally one might wish to completely remove all deteriorating lead paint, removal costs can be significant and removal technologies are not always effective. We must not, however, let our search for the "perfect" abatement technique become an excuse for inaction. Right now, for example, relatively inexpensive high technology cleaning techniques are available that can significantly reduce the presence of and resultant exposure to deteriorating lead paint and the resulting dust. In addition, efforts must be devoted to developing new abatement and prevention techniques. Once promising technologies are identified, demonstration programs must be funded to test and document their cost effectiveness. Toward this end, ASARCO supports EPA's lead research initiative that is focusing on exposure to deteriorating lead paint.

ASARCO is prepared -- and, we believe, the rest of our industry is as well -- to support properly designed legislative initiatives to help ensure that the actions discussed take place. We are also committed to working with others to pursue, through nonlegislative means, projects that help achieve the goal of reducing exposures to deteriorating lead paint and the resulting dust.

Conclusion

Few substances are subjected to as rigorous environmental and workplace regulation as lead. We submit that these regulatory measures, and the changing uses of lead, have radically reduced the public exposure levels that existed as recently as a decade ago. Taken as a whole, these developments ensure that the public can now enjoy the benefits of consumer and industrial products that use lead without significant risk of adverse health effects from these products or the processes that produce them.

At the same time, we recognize the need to address legitimate concerns that have arisen with respect to deteriorating lead paint in poorly maintained older buildings and the need to conduct effective blood lead screening programs. We are ready to cooperate with government in addressing situations in which excessive exposures to lead from past uses require remediation.

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ASARCO

Robert J. Muth
Vice President
Government and Public Affairs

May 31, 1990

The Honorable Harry Reid
United States Senate
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Dear Senator Reid:

I appreciated the opportunity to testify before your Subcommittee regarding legislation to deal with certain aspects of the potential health effects of exposure to lead. As a follow-up to the hearing, you have addressed four additional questions to me. The purpose of this letter is to respond to these questions on behalf of ASARCO Incorporated, as well as to provide you with some overall views on certain legislation that is being proposed regarding lead usage.

Question 1: "The Environmental Defense Fund has made a proposal that a tax be placed on newly mined lead, both to encourage the recycling of lead and to raise money for a wide scale abatement effort. Do you have any comments on this proposal?"

Answer: EDF has asserted repeatedly that any new lead production poses unacceptable environmental and health risks. EDF's proposal that a tax be imposed on newly mined lead is plainly part of its effort to discourage, and ultimately prevent, any such new production. Indeed, the explicit purpose of EDF's tax proposal is to shut down the primary lead industry in the United States.

Asarco obviously opposes this EDF effort. First, we disagree with the premise of the EDF position -- that all new lead production will result in unacceptable environmental or health consequences -- because the available scientific and medical evidence does not support this position. Moreover, EDF's extreme position would impose significant and broadly-based economic hardships, and would impede important, beneficial, and safe uses of lead in the United States without any detectable improvement in the environmental or health effects of lead exposure.

Furthermore, while EDF's tax proposal might accomplish its intended purpose of closing down the primary lead industry, it would essentially ensure that its stated goals of encouraging recycling of lead-containing products and raising money for

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leaded-paint abatement are not met. Lead is now the most highly recycled of all metals. Indeed, by far the most prevalent single use of lead today is for the manufacture of lead-acid automotive batteries, and over 90% of these batteries are already being recycled.

Asarco strongly supports legislative and regulatory efforts that address the challenge of raising even higher the percentage of batteries that are recycled. This is a sensible goal from the standpoint of resource conservation. At the same time, however, the most current scientific evidence shows that there is no significant environmental threat posed by lead in batteries and other products found in either municipal solid waste landfills or incinerator ash monofills. Studies have consistently shown that the earlier concern over lead contained in municipal solid waste was substantially overstated. Copies of three such studies are:

1. Characterization of Municipal Waste Combustion Ash, Ash Extracts, and Leachate, Coalition on Resource Recovery and the Environment (CORRE), March 1990;
2. Managing Ash from Municipal Waste Incinerators, Resources for the Future (RFF), November 1989; and
3. Characterization of MWC Ashes and Leachates from MSW Landfills, Monofills, and Co-Disposal Sites, U.S. EPA October 1987.

Asarco also supports constructive regulatory and legislative efforts in the area of lead paint abatement. Asarco believes that there is now a consensus that further research is required to evaluate the potential risks associated with deterioration of leaded paint, to develop broad abatement strategies, and to improve abatement technology. Accordingly, consideration by Congress of the funding mechanism for this effort should, we believe, take account of a number of relevant factors, such as (1) the impact of any tax upon specific industry sectors; (2) the effect of any tax on the international lead market and on the competitive position of the United States in that market; (3) the impact -- both positive and negative -- of the funding mechanism on public health and environmental concerns; (4) the reliability and adequacy of the revenue generated; and (5) the appropriate mix of different funding sources. There are obviously many approaches to be explored, and Asarco would like to participate in any effort to develop and shape the appropriate choices.

Question 2: "Why are so many smelters not in compliance with EPA regulations?"

Answer: I assume that your question is directed at the fact that emissions from lead smelters in the United States from time to time exceed the National Ambient Air Quality Standard for lead in the immediate area of stationary sources. (We are not aware of any basis for believing that primary smelters are not in full compliance with all other EPA -- and OSHA -- regulations or standards for lead.) I note at the outset that lead smelters are generally in compliance with their State Implementation Plans for lead under the Clean Air Act (I know that Asarco is). As you know, such plans, or "SIPs," rather than the ambient standard itself, are the compliance vehicles under the Act.

The ambient air quality standard for lead, promulgated by EPA in 1978, was primarily intended to assure a continuing reduction in lead emissions from mobile sources through the removal of tetraethyl lead from gasoline. At the time the standard was promulgated, EPA Administrator Costle recognized that a number of stationary sources, particularly lead smelters, would be unable to comply with their implementation plans if the plans were designed to ensure that emissions would not exceed the ambient standard at the fence line of the plants. Over the past 11 years, Asarco has worked closely with state and federal environmental agencies to develop realistic implementation plans for each of its plants, and the resulting plans have been carried out at very substantial costs to the company. These efforts have indeed resulted in significant reductions in lead emissions, and yet Asarco is still working to reduce emissions further -- chiefly "fugitive" emissions from the complex smelting process -- so as to satisfy the ambient standard at all locations in the immediate vicinity of the plants.

I am enclosing aerial photographs showing the sites at each of our three facilities.* Our Glover, Missouri smelter is located in a remote rural area, although an interstate highway passes close to the plant. Computer modeling shows that emissions from the plant may exceed the ambient standard only on a short, unoccupied stretch of the highway that passes within approximately 100 yards of the plant. Similarly, at our Omaha, Nebraska facility, air monitoring has shown that lead emissions from the plant do not exceed the ambient standard in populated areas, but rather only at one monitor located on top of a sewage pumping station located in an industrial area about 100 yards from the plant fence line. At East Helena, Montana, our air monitors have detected emissions exceeding the standard in a populated area, as indicated by the attached photograph. Over the past several years, Asarco has invested substantial amounts of money to reduce lead emissions, and most recently has constructed a new enclosed ore handling facility, at a cost of $16 million, designed to reduce emissions of fugitive dust. The new facility was dedicated last month. We expect that it will result in marked reductions in lead concentrations in ambient air.

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*The photographs referred to have been retained in committee files.

Current and projected emissions from Asarco's plants do not constitute a threat to public health or the environment. Nevertheless, we continue to work toward zero exceedances of the ambient air quality standard in the vicinity of our plants.

Question 3: "How does your smelter/s dispose of its waste?"

Answer: The principal waste produced by Asarco's primary lead smelters is lead blast furnace slag. Lead in the slag material is contained in an inert glass-like matrix which tends to render the contained metals immobile. Lead blast furnace slag is in part recycled to the sintering process for metallurgical reasons; the remainder is managed in piles on-site at the plants. Lead blast furnace slag is the subject of study by EPA to determine whether it should be regulated as non-hazardous waste under Subtitle D of the Resource Conservation and Recovery Act of 1986, as amended by the Hazardous and Solid Waste Amendments of 1984 ("RCRA") or regulated as a hazardous waste under Subtitle C of RCRA.

Further, other process-related "wastes" are generated at Asarco's primary lead plants, including lead process wastewaters.[1] Valuable lead-bearing solids are routinely separated from these process waters and reprocessed or reused at the smelter itself or at one of Asarco's other primary smelters. The solids are reprocessed through smelters for recovery of metal values, and the water is reused. These materials are not handled in a manner that would classify them as waste, and certainly retain significant value to be reprocessed within Asarco's plant system. Another example, of process-related "wastes" is spent furnace brick. This waste is recycled or reprocessed in the blast furnace to recover metal and fluxing material values.

Asarco's primary lead processing plants also generate other minor wastes such as cleaning solvents and used oils. These cleaning solvents and used oils are usually generated in small quantities and collected in containers on-site for pick-up by outside contractors such as Safety-Kleen Incorporated.

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[1] These process wastewaters were also excluded from federal hazardous waste regulations by the Bevill Amendment in 1980. However, recently, EPA has removed lead process wastewater from the Bevill Amendment exclusion, thus subjecting this material to RCRA Subtitle C regulation.

Finally, Asarco's primary lead plants generate other intermediate and in-process materials such as drosses and mattes in the smelting and refining of lead that contain valuable metals. However, most of these materials, because of their intrinsically valuable metal content, are reprocessed or reused at the smelter or at one of Asarco's other primary processing plants.

Question 4: "How often do you test the blood lead levels of your workers? What happens if you find a worker with high blood lead levels?"

Answer: In accordance with OSHA standards, blood tests are administered every six months to all Asarco employees exposed to air lead levels in excess of 30 ug/m^3. Those employees with blood lead levels in excess of 40 ug/dl are tested every two months. Any employee with a blood lead level in excess of 50 ug/dl is subject to "medical removal" (i.e., to a location of low air lead exposure). The employee is tested every 30 days until the blood lead level declines to less than 40 ug/dl, and the employee is reassigned only when the blood lead level falls to 40 ug/dl or when, after 18 months, the employee can be returned to the former job with the consent of the employee's physician after a prescribed physical examination. (Employees on "medical removal" of course retain the wage scale of the jobs from which they were removed.)

Over the past 10 years, the average blood lead level of employees in Asarco plants has declined from 43 ug/100g to below 29 ug/100g. This gratifying result has been achieved through extensive engineering controls, work practices, use of protective equipment, and careful attention to personal hygiene. At the present time, there are only two employees in all of our plants who are on "medical removal."

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In closing this letter, I would like to underscore Asarco's interest in working with your Subcommittee in drafting effective and responsible legislation. At the same time, I must emphasize our concern with the position advocated by EDF, and which to a disturbing degree is reflected in your bill.

Put most simply, it is EDF's position that because certain specific uses of lead chemicals in the past have posed environmental and public health concerns when dispersed into the environment, all future uses of lead, regardless of whether they can be shown to pose any significant environmental or health risk, should be banned or severely restricted. This position is not supported by accepted medical or scientific evidence and threatens to deprive consumers of safe and beneficial lead products. At the same time society forfeits new applications for lead which might contribute to technological innovation.

Asarco urges that lead products be evaluated under the same risk/utility analysis that is applied to other potentially toxic products under current laws designed to protect public health and the environment. One could foresee an example in which a new product with potential for significant innovation and benefit to society might be prohibited because it contained lead -- even if the use of lead were relatively benign -- while other products containing potentially toxic constituents would be subjected to a less rigorous test.

There is no basis for adopting special standards for lead that do not apply to other potentially toxic substances. If lead products are to be banned or restricted, these bans or restrictions should be supported by the rigorous analyses required by existing law.

We appreciate the opportunity to express our views on these important issues.

Respectfully,

Robert J. Muth

Enclosures

RJM/dp

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STATEMENT OF J. WILLIAM HORTON
VICE PRESIDENT OF JOHNSON CONTROLS, INC.
AND GENERAL MANAGER OF JOHNSON CONTROLS BATTERY GROUP
AND PRESIDENT OF THE BATTERY COUNCIL INTERNATIONAL
BEFORE THE SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT OF THE SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
MARCH 8, 1990

Good morning, Mr. Chairman and members of the Subcommittee. I am William Horton, Vice President of Johnson Controls Incorporated and General Manager of Johnson Controls Battery Group. Johnson Controls is the nation's largest manufacturer of automotive lead batteries. I also serve as President of the Battery Council International ("BCI"), on whose behalf I appear today. As you heard from other witnesses testifying today, lead batteries account for approximately 78 percent of this nation's use of lead. At least 90 percent of these lead batteries are recycled. Thus, the majority of lead today ends up being recycled for reuse and not in the municipal waste stream or the ambient environment. Accordingly, it is our view that lead battery recycling is a significant and important means of avoiding any potential lead exposures.

We are pleased to have the opportunity to discuss with you today the historic success of our industry in recycling batteries and our continuing efforts to promote and sustain very high battery recycling rates.

Allow me first, however, to provide some background on BCI. We have over 250 members worldwide, each involved in some phase of lead battery manufacturing, supply, distribution, or recycling. Domestically, our membership accounts for approximately 99 percent of the nation's lead battery manufacturing capacity, and approximately 92 percent of its battery recycling capacity. Our members account for 86 manufacturing plants located throughout the country, such as Johnson Controls' battery manufacturing plant in Bennington, Vermont. Our members also include battery retailers in every state such as Exide's automotive sales and service stations in Reno and Las Vegas, Nevada, and Wallingford, Connecticut, as well as the battery distribution centers located in each region of the country.

The lead batteries we manufacture and recycle are used for starting, lighting and ignition systems in automobiles, other vehicles and in marine systems; to power computers and household tools; and in a variety of industrial applications. In 1989, over

87 million lead batteries were sold in the United States. And lead battery usage is growing, because of consumer demand for electrical devices, the fundamental relative efficiency of this power source and, we believe, the recyclability of our product.

Few people realize that lead batteries and their components are almost completely recyclable, and even without legislative encouragement, they are being recycled! Precise recycling numbers are difficult to generate, for a variety of reasons. The USEPA stated in two 1989 reports ("The Solid Waste Dilemma: An Agenda for Action" and "The Sources of Lead in Cadmium and Municipal Waste Treatment, 1970 to 2000") that 80 percent of all spent automotive lead batteries currently are recycled. However, in a February, 1990, article in Resource Recycling magazine, the Bureau of Mines is quoted as stating that the battery recycling rate for 1988 and 1989 is in excess of 90 percent. Based on the experience of our members, BCI agrees that the battery recycling rate likely exceeds 90 percent.

Whatever the precise number, however, it is obvious that the recycling rate is high. Indeed, even at 80 percent, the rate of lead battery recycling is 1½ times greater than aluminum cans and 5 times greater than glass bottles.

What actually happens in contemporary battery recycling? Allow me to briefly outline the process.

First, after their three-to-five year useful life has ended, spent batteries are returned by consumers to retailers or recyclers. The spent batteries are then picked up by wholesalers or others and taken to secondary lead smelters.

Some secondary smelters are owned by battery manufacturers, while others are independent. While there are variations from facility to facility, the basic reclamation process at each is quite similar. In the modern secondary smelter, a continuous process breaks up the battery, shreds its plastic case, separates and treats the acids, and smelts the remaining plates and oxides to produce reusable lead and lead alloys. The lead is then shipped for battery manufacture and other uses, while the plastic is shipped for reprocessing into molding resin, and is used in battery cases, covers, vent caps and other products. The acid is either reused or neutralized. All of these activities are strictly regulated under various environmental and occupational health statutes, and are performed so as to minimize any adverse impact on workers and the environment.

In short, a sophisticated and voluntary battery recycling infrastructure exists today, and can be expected to grow. Indeed, major capital expansion programs recently have been announced by several companies that will assure continued recycling capacity into the next century.

Nonetheless, some modest percentage of batteries now or in the future may escape recycling. BCI thus has committed its resources to advancing efforts to close this gap. Allow me to cite three specific examples of our efforts.

First, BCI is actively promoting both state and federal legislation that will encourage the recycling of lead batteries and impose the least cost on consumers, retailers, distributors, and manufacturers. Our experience has shown that if retailers readily take back used batteries, and consumers are aware of their take back opportunities, consumers will voluntarily trade-in their used batteries. BCI believes, therefore, that to the extent legislation is necessary to promote recycling, such legislation should emphasize increasing consumer trade-in opportunities.

With this in mind, BCI has advanced enactment of a model state battery recycling bill that would prohibit the incineration or land disposal of batteries, require retailers to accept used batteries as returns, require point-of-sale educational signs stating that fact, and require wholesalers and manufacturers to retrieve spent batteries from retailers and take them to secondary smelters for recycling. Legislation based on BCI's model has been adopted in thirteen states to date, including California, Florida, Hawaii, Illinois, Louisiana, Maine, Minnesota, North Carolina, Oregon, Pennsylvania, Rhode Island, Washington, and Wyoming, and is under active consideration in approximately twenty other states.

As a practical matter, however, BCI believes federal legislation to address this issue would be much more appropriate than continued piecemeal adoption of state programs. Battery manufacture and distribution is a classic example of interstate commerce. Lead batteries are produced and distributed on a regional basis, and are not manufactured for sale in a specific state. When different states impose different requirements -- even seemingly innocuous differences, such as product labelling obligations -- significant and unnecessary costs are imposed on the battery manufacturing industry and, ultimately, on consumers. This is a classic interference with interstate commerce, which we believe the Congress should act to eliminate.

For this reason, BCI has urged the inclusion of a provision analogous to our model state bill in the RCRA Reauthorization and Pollution Prevention bills currently under consideration. We are pleased that such language has been included in the bills pending both in the Senate under sponsorship of yourself and Senators Chafee, Baucus, Lieberman, and others, and in the House of Representatives under the principal sponsorship of Congressman Luken.

A second example of our activities to promote recycling is wholly independent of our legislative efforts. To encourage recycling, BCI's Board of Directors recently adopted a resolution calling for the labeling of all lead batteries as recyclable.

BCI has gone so far as to develop a specific label based on the international recycling symbol, which also includes the words LEAD, RETURN, RECYCLE. We fully expect this label to be adopted nationwide by mid-1991. Uniform labeling will enable consumers to readily identify lead batteries and remind them that, when those batteries have served their useful life, they should be returned to retailers for recycling. As we noted earlier, it is our experience that when consumers are informed that batteries are recyclable, they will recycle these batteries.

A third example of our activities involves working with the administrative agencies, principally EPA. BCI is actively working with EPA to encourage adoption of programs that will further battery recycling, again without unnecessary cost or burden. For example, BCI recently filed comments on EPA's proposed performance standards for new and existing municipal waste combustors, urging the Agency to go further than its proposal by requiring recycling. In that proposal, EPA would require municipal incinerator operators to separate 25 percent of the solid waste stream, including lead batteries, with no additional requirement that these separated materials be recycled. BCI urged in our comments that EPA specifically mandate that lead batteries be both separated from the incinerator input stream and directed to secondary lead smelters for recycling.

We also have sought to open lines of communication at EPA as the Agency works to develop its overall lead strategy.

Mr. Chairman, the Subcommittee has today received a considerable amount of testimony about lead and its potential health affects. BCI fully recognizes the legitimacy of the community concerns with these matters. We also believe, however, that any fair approach to this problem will recognize that batteries constitute an extraordinarily beneficial and essential product and that any concerns that may exist about lead used in batteries can be overcome through an active, environmentally sound, battery recycling program.

Mr. Chairman and members of the Subcommittee, we thank you for the opportunity to appear here today. I will be pleased to answer any questions you may have.

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QUESTIONS AND ANSWERS FOR THE SUBCOMMITTEE ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, AND RESEARCH AND DEVELOPMENT

1. **What do you do with the residual waste that is left after recycling?**

   There are a number of residuals from the recycling process, some of which can be put back into the smelter for further reclamation, and others of which are disposed of as either hazardous or non-hazardous wastes.

   The principal residue from the recycling process is lead slag. Some of the slag is recycled, and some is disposed of either as a hazardous or non-hazardous waste. In some cases, the slag does not contain sufficient levels of heavy metals to result in its characterization under RCRA as hazardous. Thus, it is managed as a RCRA non-hazardous, or solid, waste. In other cases, the slag does test positive for toxicity, and thus is classified and managed as a RCRA hazardous waste.

   Currently, a number of companies are exploring the possibility of disposing of lead slag in permitted monofills. This disposal method would minimize potential environmental and human health concerns because monofills containing only lead slag would have less acidic conditions than hazardous or municipal waste landfills.

   Several other materials associated with the recycling process also ultimately must be disposed of. These include wastewater treatment sludges, brick linings from smelters, and the like. To the extent these materials are "hazardous" for RCRA purposes, they too are handled according to appropriate waste management regulations.

2. **Are there any toxics within that residual waste?**

   As indicated above, the resulting residues from the secondary smelting process may include low levels of lead and other metals. This is not to say, however, that the slag is always "hazardous." Lead slag is considered hazardous for regulatory purposes only if it exceeds the threshold, or regulatory, level(s) established by EPA.

3. **Do you test the blood-lead levels of your workers?**

Battery manufacturers and secondary smelters, like primary smelters, are required, pursuant to the Occupational Safety and Health Administrations's ("OSHA") lead standard, to establish blood-lead testing programs for their employees. (See 29 C.F.R. § 1910.1025.) In fact, the lead battery and recycling industries were protecting their employees through medical surveillance and biological monitoring well in advance of OSHA's lead standard, and the industry played an integral role in helping OSHA establish its medical surveillance and biological monitoring standards.

Today, battery manufacturers and recyclers meet, and in many cases exceed, OSHA's blood lead testing requirements. For example:

- OSHA requires employers to test their employees blood lead levels every two months; many in the industry test these individuals every month.
- OSHA also requires employers to test their employees every six months if they are or may be exposed to lead for greater than 30 days per year; many in the industry test these individuals every two months.
- Most, if not all, in the industry test employees for three-to-four consecutive months when they are new to the facility.

4. **Does the battery recycling industry have the capacity to meet the United States' demand for lead if no new lead were to be introduced into the market?**

Even if all available lead were recycled, there would not be sufficient quantities of lead available for the production of new batteries and other lead products. Currently, in excess of 90 percent of all lead batteries are believed to be recycled. Even if the remaining approximately 10 percent of the lead batteries, and all other lead products, are recycled, the current demand for lead in battery production likely could not be met. In addition, given the growth in the lead battery market -- which in recent years has been 2-3% annually and which likely will be accelerated by the increased demand for alternatives to the internal combustion engine and other new uses -- recycling alone will not be sufficient to provide the lead needs of our domestic market.

Turning specifically to your question, lead smelting capacity today is adequate to handle the amount of lead currently being recycled, as well as any increase in that amount that could occur in the near term. Moreover, recycling capacity is expected to increase. At least five secondary lead smelters are bringing additional secondary capacity on-line, one primary smelter is building secondary capacity, and a smelter in Canada also is expected to build new capacity. These facts recently were confirmed in a draft final 1989 report prepared by Alliance Technologies for EPA's review of the lead National Ambient Air Quality Standard ("NAAQS"). Accordingly, we do not expect capacity to be a roadblock to the maintenance of very high levels of recycling. However, as stated above, this is not to say that current or near term recycling capacity would be sufficient to handle all U.S. lead feedstocks, as well as provide sufficient supply to meet the current and future demand for lead.